

MONTHLY WEATHER REVIEW.

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No. 12.

INTRODUCTION.

This REVIEW for December, 1893, is based on reports from 2,964 stations occupied by regular and voluntary observers. These reports are classified as follows: 154 reports from Weather Bureau stations; 40 reports from United States Army post surgeons; 2,067 monthly reports from state weather service and voluntary observers; 27 reports from Canadian stations; 218 reports through the Southern Pacific Railway Company; 458 marine reports through the co-operation of the Hydrographic Office, Navy Department, and "New York

Herald Weather Service;" 106 weekly reports from 36 U. S. Life-Saving stations; 2 reports from navigators on the Great Lakes; monthly reports from local services established in all states and territories; and international simultaneous observations. Trustworthy newspaper extracts and special reports have also been used.

The WEATHER REVIEW for this month has been prepared under the general editorial supervision of Prof. Cleveland Abbe. The statistical data is furnished by Records Division.

CHARACTERISTICS OF THE WEATHER FOR DECEMBER, 1893.

HIGH AND LOW AREAS.

The high areas for December have generally pursued either extreme southerly or extreme northerly paths, and the United States has, to a large extent, been under the influence of the dry, clear sky of the areas of high pressures.

The important low-pressure storm that passed over the Lake region on the 14th and 15th was made the occasion of special Lake Storm Bulletin No. V; it was followed by an extensive area of cold northwest winds, with snow.

The highest pressures, in connection with high area No. VIII, were reported as 30.96 at Swift Current, Assiniboina, on the morning of the 12th, 30.94 at White River, Ont., on the morning of the 13th, and 30.92 at Albany, N. Y., on the morning of the 14th, being one of the most decided, long-continued high pressures that has been recorded in December.

TEMPERATURE.

Temperatures were generally above the average throughout the United States south of latitude N. 43° , but were below the average north of that limit. The mean temperature at Saint Vincent, Minn., and probably to the northward was one of the lowest on record.

PRECIPITATION.

The rain and snow fall has generally been below the average for December, except in the northern part of New England, the Lake region, and westward to Dakota. The quantity of snow has been generally up to the average in northern sections, but below the average in the southern portion of the

region where snow falls, and the same may be said as to the depth of snow lying on the ground at the end of the month.

WINDS.

Among the highest winds reported during the month have been: 106 miles per hour, on the 1st, at Pikes Peak, Colo.; 84 miles from the south, on the 20th, at Fort Canby, Wash.; 64 miles from the southwest, on the 24th, at Amarillo, Tex.; and 60 miles from the north, on the 5th, at Kittyhawk, N. C.

CROPS.

The Weather Crop Bulletin for the month of December shows that the ground was covered with snow at the close of the month north of latitude 43° , but that the region in which winter wheat is raised was uncovered and, consequently, the seed and plants have been subjected to undesirable variations in temperature; fortunately, however, the reports generally state that the ground is dry and not frozen hard, the fall grains are doing well, and plowing is being well advanced during the fine weather.

INLAND NAVIGATION.

The rivers have generally remained below the danger line, the only floods reported having occurred in the Willamette River at Portland, Oregon, on the 4th, Buffalo Creek, N. Y., on the 16th, and Roseburg, Oregon, in the Coquille River, on the 5th. The Hudson River was closed for a few days in the latter part of the month; the upper Saint Lawrence was closed December 14, being one of the earliest dates on record.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure reduced to sea level for December, 1893, as determined from observations taken daily at 8 a. m. and 8 p. m. (75th meridian time), is shown by isobars on Chart II, which also gives the so-called prevailing winds, or those most frequently observed at each station.

The normal distribution of atmospheric pressure for De-

cember and the direction of the normal wind resultant for each station is shown on Chart V. This chart has been prepared by Prof. H. A. Hazen, who has also prepared all the others of this series preliminary to the publication by the Weather Bureau of specially prepared data and charts showing the meteorological and climatic features and conditions of the United States. The pressures for both Canada and

the United States are reduced to sea level, but not to standard gravity, by Prof. Hazen's methods and formulæ. The resultant wind directions are as given by him at page 124 of his "Meteorological Tables," and are computed by Lambert's formula, giving equal weight to each observed wind without regard to its velocity.

As compared with the preceding month of November the mean pressure for December, 1893, was generally higher throughout the United States, the maximum change being +0.13 in Florida and southern Texas and +0.15 in northern Wisconsin and Manitoba. Pressure had fallen slightly on the New England coast, appreciably in Nova Scotia and Montana, and decidedly in Alberta and western Assiniboa.

As compared with the normal for this month the pressures for December, 1893, have been in excess by +0.10 or more on the coasts of Washington, Oregon, and Louisiana; also, in the interior of Georgia and South Carolina. Pressures have been about normal over the central portion of the Lake region, Iowa, Kansas, Colorado, and thence northwest to Alberta. The maximum deficit has been -0.10 or -0.15 in Assiniboa and northern Montana.

PATHS OF HIGH AND LOW AREAS.

Movements of centers of areas of high and low pressure.

Number.	First observed.		Last observed.		Path.		Average velocities.			
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.										
I.	1, a. m.	42° 96'	3, p. m.	44° 58'	2,100	2-5	840	37		
II.	1, a. m.	34° 123'	6, p. m.	36° 73'	4,500	5-5	820	34		
III.	4, a. m.	48° 83'	5, p. m.	47° 62'	1,100	1-5	733	31		
IV.	4, p. m.	44° 123'	7, p. m.	30° 93'	2,200	3-0	733	31		
V.	5, a. m.	51° 102'	8, p. m.	43° 67'	2,200	3-5	627	26		
VI.	7, a. m.	42° 121'	11, p. m.	35° 75'	2,300	4-5	511	21		
VII.	8, a. m.	53° 101'	11, p. m.	47° 75'	1,400	3-5	400	17		
VIII.	11, a. m.	53° 113'	14, p. m.	42° 67'	2,450	3-5	700	29		
IX.	13, p. m.	53° 113'	14, p. m.	53° 99'	600	1-0	600	25		
X.	14, p. m.	42° 126'	25, a. m.	33° 81'	5,200	10-5	495	21		
XI.	20, a. m.	42° 110'	21, a. m.	41° 108'						
XII.	21, a. m.	54° 96'	23, a. m.	44° 65'	1,750	2-0	875	36		
XIII.	23, a. m.	41° 116'	26, p. m.	27° 82'	3,200	5-5	506	21		
XIV.	24, a. m.	54° 98'	26, p. m.	27° 83'	3,400	4-5	533	22		
XV.	26, a. m.	43° 108'	27, a. m.	42° 105'						
XVI.	29, p. m.	47° 123'	31, a. m.	30° 103'	1,500?	1-5	1,000	42		
XVII.	29, a. m.	54° 102'	31, a. m.	50° 65'	1,600	2-0	800	33		
Sums.					34,500	54-5	10,175	-----		
Mean of 15 paths.							678	28.2		
Mean of 54-5 days.							633	26.4		
Low areas.										
I.	1, a. m.	48° 124'	4, a. m.	45° 61'	3,300	3-0	1,100	46		
II.	1, a. m.	43° 74'	2, a. m.	44° 62'	700	1-0	700	29		
III.	2, p. m.	49° 113'	6, a. m.	47° 80'	1,700	3-5	488	20		
IV.	5, a. m.	35° 73'	6, a. m.	47° 57'	1,200	1-0	1,200	50		
V.	5, a. m.	33° 100'	6, p. m.	29° 88'	950	1-5	622	26		
VI.	6, p. m.	46° 113'	11, p. m.	46° 56'	3,100	5-0	620	26		
VII.	10, a. m.	43° 118'	13, a. m.	47° 54'	3,400	3-0	1,133	47		
VIII.	12, a. m.	47° 125'	14, a. m.	47° 123'						
IX.	14, a. m.	44° 106'	17, a. m.	43° 60'	2,700	3-0	900	38		
X.	15, p. m.	47° 112'								
XI.	17, a. m.	49° 105'	20, p. m.	47° 58'	2,500	3-5	715	30		
XII.	19, p. m.	50° 111'	21, p. m.	45° 59'	2,800	2-0	1,400	58		
XIII.	20, a. m.	44° 125'	24, a. m.	45° 57'	3,100	4-0	825	34		
XIV.	23, a. m.	43° 104'	26, a. m.	46° 50'	2,500	3-0	833	35		
XV.	23, p. m.	47° 128'	29, a. m.	45° 63'	2,700?	5-5	600?	25?		
XVI.	26, p. m.	38° 125'								
XVII.	28, a. m.	49° 111'	29, a. m.	43° 98'	1,000	1-0	1,000	42		
XVIII.	30, a. m.	47° 106'	31, p. m.	46° 105'						
XIX.	30, a. m.	32° 88'								
Sums.					32,350	40-0	12,136	-----		
Mean of 14 paths.							867	36.1		
Mean of 40.0 days.							809	33.7		

The paths pursued by centers of high and low pressure during December, 1893, are shown on Charts IV and I, respectively, and the duration and velocity are given in the table at the end of this chapter. The charts show by small circles the positions of the centers. Within the circles are given the pressures reported nearest the centers and the corresponding dates. If a decided trough of low pressure or

ridge of high pressure exists at that time its location is shown by a short wavy line through the center. Sometimes distant centers are connected by such ridges or troughs, but in such cases the middle portion of the wavy line is omitted to avoid confusing the map.

HIGH AREAS.

I.—This was central on the 1st as a ridge from western Missouri to Saskatchewan, and was a continuation of high area No. VIII of the November REVIEW; the maximum pressure was then in Iowa. The center of the ridge moved southeastward, and on the morning of the 2d was in eastern Maryland, after which it turned northward over New England and disappeared on the 3d, in the afternoon, southeast of Newfoundland.

II.—The edge of an encroaching high area from the Pacific appeared off the California coast on the morning of the 1st. By the 2d, a. m., the highest pressure was near the coast of Oregon, it then moved rapidly eastward and on the 3d, a. m., was in Utah. During that day while the pressure varied but little on the Pacific coast it rose rapidly in Texas, and on the 3d, p. m., and 4th, a. m., a ridge of high pressure prevailed from Oregon to the Gulf coast, while another ridge developed from Texas northeast over Lake Huron, thus partially encircling the low area No. III, which was then central in Manitoba. A severe norther on the Gulf coast was caused by the advent of this high area. During the 4th and 5th the eastern ridge continued to exist, dividing the two low areas Nos. III and V, but by the morning of the 6th the high pressure over the Gulf of Saint Lawrence had disappeared, leaving the southern end of the ridge, as a high, central in the eastern part of North Carolina. On the 6th, p. m., this high pressure was off the North Carolina coast.

III.—On the 4th, a. m., pressure had risen north of Lake Huron while it was falling to the westward. By the 4th, p. m., a high pressure was central near Montreal, and a ridge connected this with high area No. II in the Gulf of Mexico, as before described. This center disappeared on the 5th, p. m., near Newfoundland.

IV.—When high area No. II was central in Texas on the 4th, a. m., a ridge connected it with the high pressure off the coast of Oregon, where pressure was again rising, and on the 4th, p. m., an independent high center was located there. On the 5th, a. m., the center was on the boundary between Oregon and Washington, and a second high area had developed on the east side of the Rocky Mountains, its center being at that time in Assiniboa. The data at hand are not sufficient to decide whether this latter area of high pressure was due to cold air near the surface of the earth drawn southward over Saskatchewan in the rear of low area No. III, which was then central in northern Minnesota, or whether it was due to a flow of air in the upper strata from the Pacific coast eastward over the Rocky Mountains; in the latter case this high area would be considered as a branch of high area No. IV; but I incline to the former hypothesis, and, therefore, I number it as an independent area (No. V). High area No. IV moved southeastward over Utah and was central in Texas on the 6th, p. m., and 7th, a. m., and on the coast of Louisiana on the 7th, p. m., after which it disappeared.

V.—Was central on the 5th, a. m., in Assiniboa; it had scarcely moved by the 6th, a. m., while the flow of cold air southward had caused a subsidiary high center to be formed in northern Missouri. These two centers moved eastward, the northern one more rapidly than the southern one, and on the 8th, a. m., they had joined in forming a ridge of high pressure extending from Virginia to the Valley of the Saint Lawrence. On the 8th, p. m., the highest pressure was off the New England coast, and moved thence northeastward beyond the limits of our stations.

VI.—While high area No. IV was central on the 6th in Texas

a ridge of high pressure extended thence northwest to Oregon and beyond, and the center of a new area may be located on the southern border of that state on the 7th, a. m., and 7th, p. m., while the ridge of high pressure continued to extend thence southeast to the Gulf of Mexico. The center of this ridge of high pressure remained nearly stationary between Oregon and northern Nevada until after the morning of the 9th, after which the pressure steadily diminished on the Pacific coast but rose somewhat at the southeast extremity of the ridge until, on the 10th, a. m., the highest pressure was central in Texas; after this it moved eastward, and on the 11th, p. m., it was off the coast of North Carolina, having united with high area No. VII.

VII.—During the 6th and 7th low area No. VI moved southeastward through Alberta and Assiniboia, and high areas Nos. IV and V developed, respectively, on the southwest and northeast sides of this low, as has been before mentioned; similarly in the rear of this low area and on the west and north sides, respectively, high areas Nos. VI and VII developed, so that on the morning of the 8th, while high area No. VI was central in southern Oregon, high area No. VII was central in the northern part of Manitoba; evidently the southwest movement of upper air, impinging on the coasts of Alaska and British Columbia in its circulation around the low area of the north Pacific, had in part been deflected southeastward by the resistance of the continent and contributed to the formation of high area No. VI, while it had also in part passed over the mountains into the interior of Saskatchewan and contributed to the formation of high area No. VII. (A process explained in *American Meteorological Journal*, 1892, VIII, pp. 551-552, or *American Journal of Science*, 1892, XLIII, p. 377.) These areas of high pressure continued to develop while low area No. VII, following after low area No. VI, moved between them southeastward over the Rocky Mountain region. High area No. VII was central in Manitoba on the 9th and 10th, a. m. It was north of Lake Superior on the 11th, a. m., at which time a ridge of high pressure extended south to high area No. VI, which was then central in South Carolina. On the 11th, p. m., high area No. VII was central north of Montreal, but pressure was rapidly diminishing; after this it disappeared.

VIII.—On the 9th low area No. VII developed in Alberta between high areas No. VI and VII; as soon as it had passed southeast into Wyoming on the afternoon of the 10th high area No. VII, whose center was then in Manitoba, was greatly reinforced by the approach of still higher pressure from the north, while at the same time the barometer which had been somewhat below the normal in Oregon began to fall still faster. High area No. VIII, which we place in Alberta on the 11th, a. m., may also be considered as the western end of the larger area, which at that time included high area No. VII, and extended as a long ridge from Alberta to James Bay, with another branch extending farther southeast so as to include high area No. VI, then in South Carolina. The farther progress of low area No. VII was followed by a great barometric rise from Assiniboia to Iowa, the central highest pressures being 30.96 at Swift Current, Assiniboia, on the 12th, a. m., and 30.92 at Minnedosa, Manitoba, on the 12th, p. m.; 30.94 at White River, Ontario, on the 13th, a. m., and 30.84 at Rockliffe, Ontario, on the 13th, p. m. On the 14th, a. m., the highest pressure was at Albany, N. Y., and in the afternoon it disappeared off the New England coast.

IX.—While low area No. IX was central in Wyoming on the 14th, a. m., pressure was rising rapidly to the northward, as well as on the Pacific coast, and high area No. IX moved south and east over Alberta and Saskatchewan into Manitoba, where it disappeared.

X.—This area developed on the 14th on the west side of the trough constituting low area No. VIII, and seems to have advanced directly eastward from the Pacific Ocean. It was cen-

tral on the 15th, a. m., in southeastern Oregon, and on the 16th, a. m., in northeastern Nevada, but stretching as a remarkable ridge of high pressure from Washington to Texas. The sudden appearance, rapid growth, stationary center, and prolongation parallel to the Rocky Mountain range, make this high area an excellent example of those high areas that are supposed to be formed by the slow descent of a broad upper layer of cooling air. In the present case, this upper layer is conceived of as moving from the southwest or west-southwest from the Pacific Ocean over California and Oregon on the night of the 14th, and to have reached the earth's surface first in Oregon and Nevada on the morning of the 15th, and in Colorado and New Mexico by 8 p. m. of that day; the center of the slowly descending current continued during the 16th, a. m. and p. m., and the 17th, a. m. and p. m., with very slight change of position in Idaho, Utah, and Nevada. During the 18th, however, the area of high pressure spread northward beyond Alberta, southward into Mexico, and eastward to the 100th meridian while retaining its western boundary on the Pacific coast; on the 18th, p. m., the highest pressure was confined to a small region in southern Alberta on the eastern slope of the Rocky Mountains, and this transfer of the central highest pressure northward must not disguise the fact that the great mass of air above was actually in motion toward the east and that, therefore, on the 19th, a. m., the center was in Nebraska. The eastern motion continued steadily, and on the 20th, a. m., the highest pressure was in Ohio, but the pressure had not diminished over the Rocky Mountain region and high area No. XI was located that morning as a separate area central in Utah and forming the western nucleus of a region of high barometer that covered nearly the whole of the United States. The center of high area No. X remained for five days slowly settling southward and eastward, until on the 25th it disappeared off the coast of the south Atlantic states.

XI.—This was the western portion of high area No. X; it remained central in Utah during the 20th, and had disappeared by the 22d by the gradual and general fall of pressure.

XII.—This began on the morning of the 21st as a slight elevation north of Manitoba between low area No. XIII at the mouth of the Saint Lawrence and low area No. XIV in northern Alberta. On the morning of the 22d the center was north of Montreal, and at 8 p. m. of the 22d, in northern New Brunswick, but pressure had at that time risen, especially in Nova Scotia and southern Maine, and on the 23d, 8 a. m., the highest pressure was over Nova Scotia, after which it disappeared.

XIII.—On the 22d pressure rose off the Pacific coast, and high area No. XIII was central in Nevada on the 23d, 8 a. m., while to the northward pressure was also rising rapidly in Alberta. This latter seems to have had an independent origin, as a part of high area No. XIV and the two centers (after being joined by a ridge of high pressure on the 25th) finally united entirely on the 26th in northern Missouri and Wisconsin. The general movement of high area No. XIII was southeastward into Texas, while the movement of high area No. XIV was more rapidly southeast to the point of junction in Missouri.

XIV.—Pressure rose in Manitoba on the 23d, but the high center was apparently farther north; it moved southward into Missouri, joined high area No. XIII, and thence moved slowly southeast until it disappeared on the 28th in southern Florida.

XV.—This appeared on the 26th as the western extremity of a ridge extending from high area No. XIV in Missouri westward through Colorado and northwest to British Columbia. It apparently represents a new descent of the upper air along the Rocky Mountain ridge, while low area No. XVI was off the California coast. The center remained in Wyoming during the 27th and then disappeared.

XVI.—Pressure rose on the 27th off the California coast until it was highest on the 29th, p. m., on the coast of Oregon.

On the 30th, a. m., the center was in Nevada, whence it stretched southeastward until the 31st, a. m., when it disappeared in western Texas.

XVII.—On the 28th pressure rose in Saskatchewan, and during the 29th, a. m., was central in northern Manitoba. On the 30th, a. m., the center was northeast of Lake Huron, and on the 31st, a. m., it disappeared at the mouth of the Saint Lawrence.

LOW AREAS.

I.—This area of low pressure was central on the coast of Washington on the 1st, a. m.; it moved rapidly southeast as a long oval, trending northwest and southeast into northern Texas. On the 2d, p. m., it was central in Arkansas as a long oval, trending northeast and southwest, and had already begun its northeastward movement. On the 3d, p. m., it was central in eastern New York, and disappeared on the 4th, a. m., in the Gulf of Saint Lawrence, whence it probably moved eastward over Newfoundland.

II.—On the 1st, a. m., a trough of low pressure extended from Pennsylvania to New Brunswick, the lowest pressure being in the latter region, with evidences of a subsidiary center developing in central New York. On the 1st, p. m., a well-marked center was off the coast of New England; on the 2d, a. m., it was off the coast of Nova Scotia, after which it disappeared from our map.

III.—Pressure fell during the 3d in Montana, Alberta, and surrounding regions, and on the 4th, a. m., a deep depression was central in eastern Assiniboia; the 4th, p. m., near Lake Superior. The rapid southeasterly movement now became much slower, while low area No. IV was passing along the middle Atlantic coast, and low area No. III gradually filled up, disappearing on the 6th north of the lower lake region.

IV.—On the 4th, a. m., the northwest wind on the south Atlantic coast in the rear of low area No. I apparently determined the formation of an area of rain, whirling winds, and low pressure at the southern end of the trough containing low area No. I. It is, however, possible that this storm-center existed at some distance east of the coast on the 3d, and was already moving northward on the 4th. On the 5th, a. m., its center was located some distance east of Cape Hatteras; on the 5th, p. m., it approached Nantucket; and on the 6th, a. m., it was between Cape Breton and Nova Scotia, after which it disappeared.

V.—On the 4th, p. m., a slight depression began to develop in the interior of Texas and may be located on the 5th, a. m., in the northern part of that state. It moved south and east into the Gulf and disappeared on the 6th.

VI.—On the 6th, a. m., pressure was falling in British Columbia and eastward and southeastward, forming a trough whose center may be located on the 6th, p. m., in Alberta. Its southeast movement continued until the 8th, p. m., when it was central in Iowa, after which it turned northeastward over the Lake region and passed on the 10th, p. m., over the mouth of the Saint Lawrence; it disappeared on the 11th, p. m., off the southern coast of Newfoundland.

VII.—In the rear of low area No. VI a trough extended northwestward into British Columbia on the 9th, out of which there developed low area No. VII, whose center is located on the morning of the 10th on the northern border of Washington. After moving southeast into Nebraska it turned off eastward on the 11th and was central 12th, a. m., in the state of New York. The map of the 12th, p. m., shows a low area on the coast of Nova Scotia which disappeared on the 13th, a. m., south of Newfoundland and was probably the continuation of low area No. VII.

VIII.—Pressure fell on the coast of Washington after the 11th, p. m., and low area No. VIII was located there on the 12th, a. m. The pressure fell slowly without any decided movement of the center until the 14th, a. m., after which this low

area filled up and disappeared at that spot. Meantime its extension southeastward had given rise to a separate low center (No. IX) located in Wyoming on the 14th, a. m.

IX.—This center moved southeastward into Nebraska and was central on the 15th, a. m., in Iowa, whence its path turned northeastward, and on the 15th, p. m., the center was on Lake Michigan, with high winds and gales throughout the Lake region. On the 16th, p. m., the center was near the northern boundary of New Hampshire, and on the 17th it passed over the Gulf of Saint Lawrence and Newfoundland and disappeared.

X.—On the 15th pressure fell in Alberta and by 8 p. m. a moderate depression was central in that province, but it seems to have immediately filled up or possibly moved rapidly eastward and disappeared.

XI.—This depression was apparently central north of Alberta on the 16th, p. m.; in Saskatchewan on the 17th, a. m.; Manitoba on the 17th, p. m. By the 18th, p. m., it was central on the northern border of Lake Huron and a severe storm raged over the Lake region and southward to the Ohio and Missouri rivers. The path of the center now turned northeastward and was over New Brunswick on the 19th, p. m.; it disappeared off the southern coast of Newfoundland on the 20th, p. m.

XII.—On the 19th pressure fell in Saskatchewan and Alberta, and the southern portion of a depression was apparently moving southeastward along the northern limits of our daily weather map. The center of this depression at no time came within the limits of our stations, and it disappeared on the 21st, p. m., at the Straits of Belle Isle.

XIII.—On the 20th an important depression approached the shores of Washington and British Columbia, and possibly low area No. XII was but the eastern extremity of this larger area advancing from the Pacific and which was apparently then moving northeast over Vancouver Island. On the 21st, p. m., it was central in northern Saskatchewan, and the 22d, a. m., in Manitoba. The center was near Halifax, N. S., on the 23d, p. m., and it passed eastward south of Newfoundland on the 24th.

XIV.—On the 23d pressure fell in Colorado and neighboring states, and low area No. XIV developed in that region without any clearly apparent preceding history, but from the subsequent approach of low area No. XV, as well as the behavior of low area No. XIII, it seems probable that the inflow of air in the rear of low area No. XIII started several whirls in the lower strata far to the south of the main center, and that one of these on the 22d found the conditions on the central-eastern slope favorable to its further development; this appears to be the ordinary history of the origin of new whirls on the eastern Rocky Mountain slope and in the Gulf of Mexico. On the 23d, a. m., the center may be located in western Nebraska, and on the 23d, p. m., in western Kansas, after which it began moving east and northeast. It was central in Iowa the 24th, p. m. On the 25th it passed northeastward over the Lake region, with gales at most stations, the depression being then an ellipse whose longer axis trended northeast and southwest. It moved rapidly over Maine and disappeared south of Newfoundland on the 26th.

XV.—Pressure fell on the 23d on the coast of Washington, and on the 24th the low center passed northeastward into British Columbia just beyond the limits of our stations. Its course during the 24th and 25th is uncertain, but on the 26th, p. m., the low area was central north of Alberta and Saskatchewan, and during the 27th there was a general fall of pressure throughout the Canadian Provinces to the eastward; on the 27th, p. m., the low pressure was central not far north of Lake Superior, after which the southeastward movement changed to northeast, and the depression disappeared on the 29th, a. m., on the Gulf of Saint Lawrence.

XVI.—On the 25th pressure was falling on the California coast, apparently due to the advance of an area of low pressure northeastward toward Oregon; the lowest pressure was apparently nearest the coast of northern California on the 26th, p. m., after which it rapidly filled and entirely disappeared, giving place to high area No. XVI.

XVII.—On the 28th, while high areas Nos. XVI and XVII prevailed over Oregon and Saskatchewan, respectively, a trough of low pressure developed rapidly and pushed southeastward between them from Alberta to South Dakota, and on the 29th, a. m., this trough extended from Montana southeast to Kansas, while a separate branch appeared on the Gulf coast. During the 29th the central portions of the low area filled up, and

the map of the 30th, a. m., shows in its place low areas Nos. XVIII and XIX central in Assiniboia and Alabama, respectively.

XVIII.—This remnant of low area No. XVII extended southeastward on the 30th and then partly filled up, so that on the 31st, p. m., it was still central in Assiniboia.

XIX.—This southern prolongation of the trough, containing low area No. XVII, was central in eastern Texas on the 29th, evidently formed under conditions favorable to a whirl initiated by the southern flow of colder air into the Gulf coast region. While moving eastward it stretched northeastward on the 30th, as a trough over the south Atlantic states, and disappeared on the 31st.

NORTH ATLANTIC STORMS FOR DECEMBER, 1893.

[Pressure in inches and millimeters; wind-force by Beaufort scale]

The paths of storms that passed over the western portion of the north Atlantic Ocean are shown on Chart I, so far as can be traced from information received up to the 25th of January, through the co-operation of the Hydrographic Office, U. S. Navy, and the "New York Herald Weather Service."

The normal pressure for December, as shown by the international simultaneous observations, is highest, 30.50 (775), in central Asia between E. 80° and E. 110° on the parallel of N. 50° ; it is high, 30.20 (797), in the south Atlantic states between W. 80° and W. 90° on the parallel of N. 34° . The pressure is low, 29.60 (752), in Bering Sea between longitude E. 155° and W. 155° on the parallel of N. 55° ; it is lowest, 29.50 (752), in the north Atlantic Ocean in an oval stretching from southern Greenland to northern Norway. Between these centers of lowest pressure lies the Arctic region into which storm-centers rarely penetrate very far. Those that have been traced northeastward over the Atlantic during the winter months seem to turn eastward over Norway and Sweden, or if they go past North Cape they are apt to turn southeastward into Russia, and in either case they break up or die out before reaching Siberia. It seems evident that although the mechanical conditions are not unfavorable to the formation of whirls and low pressures within the Arctic circle yet the low temperature and small amount of moisture in the air constitute thermo-dynamic conditions that are unfavorable to the growth and perpetuity of such whirls. It is a matter of almost daily experience to find several independent whirls and low centers included within one large region of low pressure extending from the Aleutian Islands across North America to Greenland and extreme northern Europe, and there can be little doubt but that air flowing as upper southwest currents into such a low region from the regions of high pressure over North America and Asia and over the tropical portions of the Atlantic and the Pacific initiates these separate whirls, but it maintains them only with the help of the thermal disturbances produced by the formation of rain, snow, and clouds.

The normal pressure in December is at the maximum about 0.20 inch lower in the region between Iceland and Greenland than in November, and in general it is lower over the north Atlantic but higher over the tropical Atlantic, and over the interior of the North American continent. The region over which the maximum number of storm tracks was recorded during the years 1878-1887 passes from Japan over the southern extremity of Corea through Bering Sea to the southern extremity of Alaska; thence over the coasts of British Columbia into Oregon; thence nearly due east to southern Newfoundland; thence east-northeast over the Orkney Islands to northern Norway and Sweden; thence southeast to the interior of Russia. Observations are not at

hand to trace this belt of storm-centers from Russia to the Pacific Ocean but the indications are that all cyclonic whirls are dissipated in this region of clear, dry, cold, and probably descending air.

The average velocity of movement of the north Atlantic storms in December is about 21 statute miles per hour over the north Atlantic Ocean, but about 36 miles per hour over the United States, where the movement is more rapid than in any other part of their course from Bering Sea to Europe. During the 10 years, 1878 to 1887, 3 storms were traced continuously over the entire North American continent and the Atlantic Ocean and 1 storm over that continent and ocean and Europe.

During December, 1893, the following areas of low pressure, with revolving winds, have been approximately traced on the Atlantic Ocean:

A. This was the continuation of low area No. II over the United States, as above described; it passed northeastward over southern Newfoundland, and on the 4th apparently approached Iceland.

B. This was central on the 4th, a. m., in the Gulf of Saint Lawrence and was a continuation of low area No. I of the United States series; it passed rapidly northeastward, being south of Iceland on the 6th, after which it turned northward.

C. This was low area No. IV of the United States series; it was central near Cape Breton on the morning of the 6th, and was south of Iceland, approximately at N. 58° , W. 12° , on the 8th, while severe gales raged in the northern part of Great Britain, Ireland, and over the ocean to the westward and southward; it then turned northeast.

D. This seemed to have started as an extreme western branch of C in the region of northwesterly gales that prevailed on the 8th south of Greenland; it was central on the 9th in about N. 58° , W. 28° , and on the 10th, in about N. 55° , W. 12° , as a long oval or trough; it disappeared on the 11th north of Great Britain in the course of the development of a very large area of very low pressure whose center was farther north.

E. This small whirl was located on the 11th as an extension of D to the south-southwest; by the 12th it had moved slightly northward.

F. This whirl was also located on the 11th, when it was west of E in N. 50° , W. 35° ; it moved eastward slowly, and on the 12th both E and F were comprised within a trough extending from W. 15° to W. 45° and about N. 52° . Farther west or northwest this trough joined low area No. VII of the United States series, which had extended rapidly northeastward.

G. This was a continuation of low area No. VII of the United States series, which, after moving to the southeast of Newfoundland, turned eastward and joined F and E on the 15th, forming a region of low pressure which at that time

apparently extended from N. 60° , W. 20° , to N. 65° , E. 10° ; by the 18th the eastern portion of this low pressure had passed North Cape and turned southeast into Russia.

H. This was the continuation of low area No. IX of the United States series, which was central in the Gulf of Saint Lawrence on the 17th; it passed toward east-northeast rapidly and was off the coast of Ireland on the 19th; then moved northeast, while a secondary depression formed in the Irish Channel; it was almost stationary between Scotland and Iceland from the 20th to the 22d, when it was joined by *I*, and, together with *J* and *K*, developed into a large area of low pressure which, on the 25th, extended from the middle of the north Atlantic over Scandinavia and Russia.

I. This was a continuation of low area No. XI of the United States series, which, on the 20th, was central south of Newfoundland and moved thence northeast, being at N. 57° , W. 35° , on the 21st, and N. 60° , W. 15° , on the 22d, when it had joined with *H*.

J. This was the continuation of low area No. XII, United States series, which passed eastward over southern Labrador on the 21st, and was central on the 23d at about N. 56° , W. 30° . On the 24th it was apparently south of Iceland, and on the 25th at N. 64° , W. 5° .

K. This was a continuation of low area No. XIII, which was central south of Newfoundland on the 24th, and at N. 52° , W. 35° , on the 25th; it passed quite near Iceland, while an area of high pressure pushed northward over Europe, so that, on the 28th, a region of low pressure apparently connected *K*, *L*, and *M*, and extended from James Bay and Lake Superior over Labrador and southern Greenland. On the 29th and 30th the extreme northeastern end of this region moved southeast and developed into an extensive low area in northern Russia on the 30th and 31st, which apparently represents the further development of the North Atlantic storm area *K*.

L. This was a continuation of low area No. XIV of the United States series, which was central east of Cape Breton on the 26th. It developed into a long oval on the 27th, and dis-

appeared on the 29th southwest of Iceland as a branch of the extensive low pressure just described.

M. This was a continuation of low area No. XV, United States series, which was central on the southern coast of Labrador on the 29th; it moved east-southeast and was at N. 47° , W. 47° , on the 30th, after which it filled up and disappeared in the presence of the extensive area of high pressure that then stretched from central Europe westward to the middle of the Atlantic.

OCEAN ICE IN DECEMBER.

The limits of the regions within which field ice or icebergs were reported for December, 1893, are shown on Chart I by crosses. On the 27th one small berg was reported in N. $47^{\circ} 05'$, W. $50^{\circ} 43'$; on the 29th one large berg was observed in N. $47^{\circ} 16'$, W. $49^{\circ} 36'$; on the 31st in N. $47^{\circ} 35'$, W. $49^{\circ} 00'$ a berg about 60 feet high was reported.

In December, 1882, 1883, 1884, 1886, and 1888, no Arctic ice was reported near Newfoundland and the Grand Banks. In 1885 several bergs were observed off the Newfoundland coast the early part of the month. In 1887 a small berg was reported in N. $46^{\circ} 10'$, W. $47^{\circ} 28'$ on the 26th, and a small berg in N. $48^{\circ} 20'$, W. $48^{\circ} 40'$ on the 28th. In 1889 large quantities of Arctic ice were reported over and near the Grand Banks. In 1890 a large berg was observed in N. $49^{\circ} 39'$, W. $47^{\circ} 50'$ on the 13th. Arctic ice was not reported for December, 1891 and 1892.

OCEAN FOG IN DECEMBER.

The limits of fog belts west of the 40th meridian, as determined by reports of shipmasters, are shown on Chart I by dotted shading. East of the 55th meridian fog was reported on 11 dates; between the 55th and 65th meridians on one date; west of the 65th meridian fog was not reported on any date. Compared with the corresponding month of the last 6 years the dates of occurrence of fog east of the 55th meridian numbered 7 more than the average, and west of the 55th meridian 4 less than the average.

TEMPERATURE OF THE AIR (expressed in degrees Fahrenheit).

The distribution of the monthly mean temperature of the air over the United States and Canada is shown by the dotted isotherms on Chart II; the lines are, however, not drawn for the higher irregular surface of the Rocky Mountain plateau; the temperatures have not been reduced to sea level, and the isotherms, therefore, relate to the average surface of the country over which they are drawn; in mountainous regions such isotherms would be controlled largely by the topography, and it is, therefore, not practicable to present the temperature data in this manner unless a contour map on a large scale is published as a base chart.

In the table of meteorological data from voluntary observers the actual mean temperature is given for each station, and in the tables of climatological data for the regular stations of the Weather Bureau both the mean temperatures and the departures from the normal are given. In the latter table the stations are grouped by geographical districts, for each of which is given the average temperature and departure from the normal. The normal for any district or station may be found by adding the departures to the current average when the latter is below the normal and by subtracting when it is above.

For the regular stations of the Weather Bureau the monthly mean temperature is the simple mean of all the daily maxima and minima; for voluntary stations a variety of methods of computation is necessarily allowed, as shown by the notes appended to the table of meteorological data.

During December, 1893, the mean temperature was highest (70.8) at Key West. The temperature averaged between 60 and 70 throughout the peninsula of Florida and on the immediate coast of Louisiana and Texas; it was slightly above 60 at a few stations in southern California near Arizona. The temperature averaged 32 in a zone that included Cape Cod, Rhode Island, southern Connecticut, northern New Jersey, central Pennsylvania, Ohio, Indiana, Illinois, northern Missouri, northern Kansas, southern Nebraska, the greater part of Colorado, Utah, northern Nevada, eastern Oregon, and northeastern Washington. The lowest average temperatures appearing on our maps were -8.0 at Winnipeg, Manitoba, and -8.2 at Prince Albert, Saskatchewan.

DEPARTURES FROM NORMAL TEMPERATURE.

As compared with the normal for this month temperatures have been deficient by about 5, or more, in northern New England, the Valley of the Saint Lawrence, the northern portion of the Lake region, Wisconsin, Minnesota, and Manitoba. Among the principal deficits are: -5.1 at Chatham, N. B., -8.7 at Rockliffe, Ont., -13.8 at White River, Ont., -11.0 at Winnipeg, Manitoba, and -9.0 at Moorhead, Minn. The temperature has been normal or above normal in all the south Atlantic and Gulf states and the Pacific coast and Rocky Mountain region. The maximum excesses have been: $+5.5$ at Dodge City, Kans., $+4.9$ at Corpus Christi, Tex., $+4.3$ at Abilene, Tex., $+4.2$ at Denver, Colo.

The following table shows for certain stations, as reported

by voluntary observers, (1) the normal temperature for December for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for December, 1893; (4) the departure of the current month from the normal; (5) the extreme monthly means for December and the years of their occurrence during the period of observation:

State and station.	(1) Normal for the month of Dec.	(2) Length of record.	(3) Mean for Dec., 1893.	(4) Departure from normal.	(5) Extreme monthly means for December.			
					Highest.	Year.	Lowest.	Year.
Arizona.	0	Years	0	0	0	1889	27.6	1891
Fort Apache	37.6	22	40.2	+ 2.6	45.0	1889	47.6	1891
Fort Mohave.	53.1	21	52.7	- 0.3	59.2	1875	47.6	1891
Whipple Barracks	37.8	21	34.7	- 3.1	42.2	1889	31.4	1891
Arkansas.								
Keesee Ferry	39.6	12	42.4	+ 2.8	55.3	1889	29.1	1884
California.								
Riverside	52.7	11	53.8	+ 1.1	56.5	1882	48.3	1891
Colorado.								
Las Animas.	30.7	10	33.6	+ 1.9	41.9	1889	19.5	1884
Florida.								
Merritts Island	63.3	11	65.5	+ 2.2	68.0	1891	58.0	1885
Georgia.								
Forsyth	50.0	19	54.0	+ 4.0	61.3	1889	39.8	1876
Idaho.								
Boise Barracks	33.1	18	34.3	+ 1.2	37.7	1886	28.1	1884
Fort Sherman.	30.6	10	34.2	+ 3.6	37.9	1890	16.0	1884
Indiana.								
Lafayette	30.0	12	30.0	0.0	43.8	1889	21.3	1880
Iowa.								
Cresco	17.7	22	16.6	- 1.1	34.0	1877	4.5	1876
Kansas.								
Eureka Ranch	32.6	10	35.4	+ 2.8	43.6	1889	21.3	1884
Independence.	35.1	21	39.6	+ 4.5	49.3	1889	25.4	1884
Louisiana.								
Grand Coteau	56.0	11	55.9	- 0.1	65.0	1889	51.8	1887
Maine.								
Orono	21.3	23	14.8	- 6.5	31.6	1891	11.4	1890
Maryland.								
Cumberland	32.1	22	35.2	+ 3.1	43.2	1889	26.0	1880
Michigan.								
Kalamazoo	29.5	17	28.4	- 1.1	40.2	1889	16.7	1876
Missouri.								
Sedalia	36.3	8	35.2	- 1.1	49.4	1889	25.7	1886
Montana.								
Fort Custer	23.4	13	31.0	+ 7.6	33.1	1885	5.6	1884
Nebraska.								
Fort Robinson	28.6	9	30.4	+ 1.8	38.0	1889	12.4	1884
Genoa (near).	23.7	18	25.8	+ 2.1	35.4	1889	11.8	1879
Nevada.								
Browns.	35.2	21	.....	.....	42.1	1871	26.8	1873
Carson City.	34.0	16	37.3	+ 3.3	40.8	1886	29.1	1891
New Hampshire.								
Hanover	20.8	22	19.0	- 1.8	30.5	1881	10.2	1872
New Mexico.								
Deming	46.6	11	53.4	+ 6.8	53.4	1893	38.4	1891
Fort Wingate.	32.7	22	38.6	+ 5.9	41.0	1889	23.7	1887
New York.								
Cooperstown	27.0	22	24.8	- 2.2	33.9	1891	14.7	1876
Plattburg Barracks	21.7	22	19.2	- 2.5	33.8	1891	11.3	1890
North Carolina.								
Lenoir	38.4	21	39.9	+ 1.5	48.9	1889	29.1	1876
Oklahoma.								
Fort Reno	39.7	10	43.2	+ 3.5	52.6	1889	27.9	1884
Fort Sill	40.3	21	44.2	+ 3.9	52.3	1889	31.0	1884
Fort Supply	37.6	13	37.7	+ 0.1	49.2	1889	29.9	1887, 92
Oregon.								
Bandon	46.7	9	47.6	+ 0.9	52.5	1888	43.6	1884
Pennsylvania.								
Dyberry	25.6	22	25.9	+ 0.3	34.6	1891	17.3	1876
Grampian	25.8	22	20.4	- 3.6	37.0	1877	16.0	1876
Wellsboro	29.5	14	28.3	- 1.2	39.5	1881	22.2	1890
South Carolina.								
Statesburg	47.8	12	49.9	+ 2.1	56.6	1889	43.6	1882
South Dakota.								
Fort Sully	19.1	22	21.2	+ 2.1	30.0	1881	2.9	1879
Texas.								
Austin	50.2	21	56.2	+ 6.0	65.5	1889	42.1	1872
Silver Falls	45.0	7	46.4	+ 1.4	56.1	1889	37.6	1892
Utah.								
Terrace	27.8	21	35.0	+ 7.2	37.0	1888	17.0	1878
Vermont.								
Strafford	22.0	20	19.5	- 2.5	31.2	1891	13.4	1890
Virginia.								
Dale Enterprise	38.2	13	37.6	- 0.6	49.0	1889	28.4	1882
Washington.								
Fort Townsend	40.8	18	45.6	+ 4.8	45.6	1893	33.0	1884
West Virginia.								
Parkersburg	38.2	12	37.2	- 1.0	47.2	1889	29.6	1886
Wisconsin.								
Madison	23.0	21	20.0	- 3.0	38.4	1877	10.8	1876
Wyoming.								
Fort Washakie	22.9	10	27.6	+ 4.7	29.6	1889	16.4	1892

YEARS OF HIGHEST MEAN TEMPERATURE FOR DECEMBER.

The mean temperature for December, 1893, was the highest

on record at several stations, as follows: Port Angeles, Wash., 41.5, being 3.3 in excess of the normal, the highest previous temperature for December being 41.0 in 1888. Red Bluff, Cal., 50.2, or 0.6 above the normal; the highest previous was 50.0, in 1886. Carson City, Nev., 39.0, or 4.1 above the normal; the previous highest was 38.5, in 1888. Helena, Mont., 31.2, 7.5 above the normal; the previous highest was 31.1, in 1885.

The highest mean temperature for December was noted generally over New England and eastern New York in 1891; over northern Dakota, the northern plateau region, and southern California in 1890; from the middle and southern Rocky Mountain regions eastward to the middle and south Atlantic coasts in 1889; along the north Pacific coast and over Oregon, northern California, and northern Nevada in 1886; on the northeast slope of the Rocky Mountains in 1885; and from the upper Mississippi valley over the upper lake region in 1877.

YEARS OF LOWEST MEAN TEMPERATURE FOR DECEMBER.

The mean temperature for December, 1893, was the lowest on record at Saint Vincent, Minn., being -2.7, or 9.1 below the normal; the lowest previous temperature for December was -0.7, in 1886.

The lowest mean temperature for December was noted at points in California, Nevada, and New Mexico in 1891; in the middle and northern Rocky Mountain regions in 1884; and generally east of the Mississippi River and south of the Lake region in 1876.

MAXIMUM TEMPERATURE.

The highest temperatures recorded at regular stations of the Weather Bureau are given in the table of climatological data, from which the following are selected: Key West, Tampa, Titusville, Fla., and San Diego, Cal., 82; San Antonio, Tex., and Yuma, Ariz., 83; Los Angeles, Cal., 88; Eastport, Me., 52; Northfield, Vt., 54; Sault Ste. Marie, Mich., 38; Duluth, Minn., 43; Saint Vincent, Minn., 42; Havre, Mont., 52; Spokane, Wash., 49; Tatoosh Island, Wash., 59; Port Angeles, Wash., 61.

MINIMUM TEMPERATURE.

The lowest temperatures recorded at regular stations of the Weather Bureau are given in the table of climatological data, from which the following are selected: Key West, Fla., 56; Tampa and Titusville, Fla., 38; San Antonio, Tex., 20; Corpus Christi, Tex., 36; Yuma, Ariz., 34; San Diego, Cal., 38; San Francisco, Cal., 37; Eastport, Me., -11; Northfield, Vt., -27; Sault Ste. Marie, Mich., -14; Duluth, Minn., -19; Saint Vincent, Minn., -24; Havre, Mont., -20; Spokane, Wash., 16; Port Angeles, Wash., 28; Tatoosh Island, Wash., 30.

TEMPERATURE, JANUARY TO DECEMBER, 1893.

For the period, January 1st to December 31st, the average temperature was about normal in the east and west Gulf states, the extreme northwest, and the southern Rocky Mountain plateau. In regions where the temperature was deficient the average deficit for this period was as follows: Northern plateau, 2.5; north Pacific coast, 2.0; middle Pacific coast, 1.7; south Pacific coast, 1.1; middle plateau, 1.3; upper Mississippi valley, 1.5; New England, 1.3; middle Atlantic states, 1.1; the Lake region, 1.0; northern slope, 0.9; Missouri Valley, 0.8; Ohio Valley and Tennessee, 0.7; middle slope, 0.6; south Atlantic states, 0.5; Key West, Fla., 0.4; east Gulf states, 0.2. The only regions in which the average temperature for this period was in excess are the southern slope, 1.6; and the east Gulf states, 0.2.

DAILY AND MONTHLY RANGES OF TEMPERATURE.

The greatest daily range of temperature is given for each of the regular Weather Bureau stations in the table of climatological data. The extreme monthly maximum and

minimum temperatures are also there given, from which the monthly ranges may be deduced. The monthly range has averaged 50, or more, from central Texas northeastward to New England and northwestward to Montana, except at a few stations on the shores of the Lakes; the monthly ranges of 70, or more, are reported as follows: Northfield, Vt., 81; Valentine, Nebr., and Saint Vincent, Minn., 76; Fort Benton, Mont., and Bismarck, N. Dak., 73; Keokuk, Iowa, and Havre, Mont., 72.

The least monthly ranges have been: Key West, Fla., 26; Titusville, Fla., 37; San Diego, Cal., 34; San Francisco, Cal., 35; Eureka, Cal., 27; Tatoosh Island, Wash., 19; Fort Canby, Wash., 16.

LIMITS OF FREEZING TEMPERATURE.

The southern limit of the region within which the air has had a freezing temperature at some time during the month is approximately shown by the full and dotted lines on Chart VI joining the places at which minimum temperatures of 32 and 40, respectively, occurred within the instrument shelters of the Weather Bureau; the latter minimum is usually accompanied by a more or less severe frost on the ground outside of the shelter. During December, 1893, the line of minimum 40 crossed the southern portion of the peninsula of Florida south of the stations of Titusville and Tampa; it does not reappear on either the Gulf or the California coasts. The line of minimum 32 passes from Cape Hatteras along the south Atlantic coast, crossing Florida to Cedar Keys and thence westward to New Orleans, La.; it then follows the curved coast line of Texas about 100 miles from the Gulf; it reappears near Yuma and keeps within 100 miles of the California coast until it reaches Vancouver Island.

PERIODS OF HIGH TEMPERATURE.

The most interesting period of high temperature began on the eastern slope of the Rocky Mountains from Montana to Nebraska on the 21st; as this area of high temperature moved eastward the maximum temperatures of the month occurred on the 22d from Oklahoma to Minnesota, on the 23d from Missouri to Lake Superior, on the 24th from Tennessee to Michigan, on the 25th from Georgia to New York and New England.

PERIODS OF LOW TEMPERATURE.

The minimum temperatures for the month occurring in connection with the movement of areas of high pressure were experienced in Montana and the Dakotas on the 12th, Minnesota and New York on the 13th, New England on the 14th. Another series of low temperatures was that which occurred from Nebraska and Iowa to Texas on the 1st, and moving eastward covered Ohio and the lower lake region on the 2d. Another area of minimum temperatures covered Arkansas, Louisiana, and southeastern Texas on the 4th, whence it moved northeastward over Mississippi, Alabama, Georgia, and Tennessee on the 5th, and North Carolina, Maryland, and central Pennsylvania on the 6th. The lowest temperatures on the Pacific coast generally occurred on the 28th, 29th, and 30th, whence they spread over the central and southern Rocky Mountain region on the 30th and 31st.

FROST.

The reports of frost injurious to vegetation are as follows: At Orange City, Fla., the frosts of the 6th and 19th injured gardens. At Myers, Fla., the frost of the 19th damaged vegetation, and in many parts of the county vegetation was killed. Titusville, Fla., 19th, a heavy frost in the country, some tomatoes seriously injured.

The following table shows the dates of the occurrence of the first light frost, the first heavy frost, and the first snowfall at the respective stations:

Dates of first light and heavy frosts and snow, December, 1893.							
State and station.	First frost.		Snow.	State and station.	First frost.		Snow.
	Light.	Heavy.			Light.	Heavy.	
<i>Alabama.</i>							
Chepultepec					17		
Gadsden			18				
Lynn			18				
Scottsboro			3				
Talladega			17				
Union Springs			31				
<i>Arizona.</i>							
Arizona Canal Co. Dam	29						
Florence	25						
Oracle			23				
Payson			23				
Wilgus			15				
<i>Arkansas.</i>							
Corning			30				
Fayetteville			2				
Fort Smith			3				
Helena			30				
Keesee's Ferry			3				
Little Rock			30				
Lonoke			30				
New Gascony			30				
Seaville			3				
<i>California.</i>							
Anderson		3					
Berkley	15						
Centerville		30					
Chino	29						
Claremont		29					
Cloverdale		28					
Colegrove	28						
Colusa		16					
Duarte	28						
Fall Brook	11	29					
Georgetown			24				
Grass Valley			24				
Lick Observatory			24				
Los Angeles	28						
Mokelumne Hill		15					
Napa		29					
Nevada City			24				
Newcastle	23						
Ojeta			24				
Pasadena		29					
Petaluma	3						
Placerville			24				
Point Reyes Light	28						
Pomona		29					
San Francisco	23						
Santa Cruz			15				
Sonoma	29						
Tehachapi			25				
Ventura			27				
Wenrich Ranch			24				
Yreka			14				
<i>Connecticut.</i>							
Colechester		3					
Lebanon		3					
North Grosvenor Dale		3					
Norwalk		3					
South Manchester		3					
Stevenson		16					
Storrs		3					
Voluntown		3					
<i>Delaware.</i>							
Dover		5					
<i>Florida.</i>							
Brooksville		18					
Clermont	19						
Deland	19						
Eustis	6						
Federal Point		19					
Fort Meade	5	19					
Homeland	6	19					
Kissimmee	6	19					
Manatee	6						
Myers		19					
Ocala	6						
Orange City	6						
Orlando		18					
Oxford		19					
Pensacola		5					
Plant City		7					
Saint Petersburg	19						
Tallahassee		5					
Tampa	6						
Tarpon Springs	6						
Titusville	19						
<i>Georgia.</i>							
Adairsville			23				
Atlanta		17					
Covington		17					
Dahlonega		17					
Lafayette		19					
Whitesburg		17					
<i>Illinois.</i>							
Beardstown							
Cairo	3						
Carlinville		2					
Golconda		17					
Greenville		1					
Jordans Grove		3					
McLeansboro		3					
Mascoutah		2					
<i>Louisiana.</i>							
Baton Rouge			4				
Emilie			5				
Franklin			4				
Grand Coteau			4				
Hamburg			4				
Houma			5				
Lake Charles			4				
Pinecourtville			4				
Port Eads			5				
Rayne			8				
Thibodeaux			5				
Walence			4				
Winnsboro			0				
<i>Maine.</i>							
Fairfield							
<i>Maryland.</i>							
Cambridge							
Easton							
<i>Massachusetts.</i>							
Andover							
Ashland							
Cambridge							
Fall River							
Framingham							
Hyannis							
Long Plain							
Lowell							
Ludlow Center							
Lynn							
Middleboro							
New Bedford							
Salem							
Somerset							
Vineyard Haven							
Williamstown							
Winchendon							
<i>Mississippi.</i>							
University							
Water Valley							
<i>Missouri.</i>							
Appleton City							
Arlington							
Arthur							
Big Piney							
Birch Tree							

Dates of first light and heavy frosts and snow—Continued.

State and station.	First frost.		Snow.	State and station.	First frost.		Snow.				
	Light.	Heavy.			Light.	Heavy.					
<i>Missouri—Cont'd.</i>											
Bluffton			3	Camden							
Boonville			2	Cape May C. H.	3						
Darksville			3	Dover	3						
East Lynne			2	Friesburg	5						
Emma			3	Gillette	4						
Fayette			2	Hightstown	3						
Fulton			3	Imlaystown	2						
Gayoso			30	Newton	2						
Glasgow			2	Oceanic	4						
Grove Dale			3	Pensauken	3						
Half Way			2	Readington	3						
Harrisonville			2	River Vale	3						
Hastain			3	Tenafly	3						
Hermann			2	Vineland	3						
Houston			3	Whiting	5						
Ironton			2	Woodbine	6						
La Plata			2	<i>New Mexico.</i>							
Lebanon			3	Albert	5						
Linn Creek			2	East Las Vegas	1						
Marceline			2	Gallinas Spring	29						
Mine La Motte			2	<i>New York.</i>							
New Haven			3	New York	3						
New Madrid			3	Poughkeepsie	3						
New Palestine			2	Setauket	3						
Oak Ridge			2	<i>North Carolina.</i>							
Olden			2	Asheville	18						
Phillipsburg			3	Chapel Hill	5						
Potosi			3	Charlotte	5						
Panacea			3	Horse Cove	7						
Rolla			2	Lenoir	2						
Round Spring			3	May	5						
Saint Charles			3	Mount Pleasant	5						
Sarcocie			3	Oak Ridge	5						
Steelville			2	Pittsboro	5						
Vancleve			2	Rockingham	5						
Virgil City			2	Salisbury	5						
Warrenton			3	Saxon	5						
<i>Nevada.</i>											
Battle Mountain			13	Sloan	6						
<i>New Hampshire.</i>											
Durham			3	Smithfield	5						
<i>New Jersey.</i>											
Astbury Park			4	Soapstone Mount	5						
Atlantic City			4	Southern Pines	5						
Belvidere			5	Washington	31						
Blairstown			3	<i>Ohio.</i>							
Bridgeton			5	Bloomingburg	2						

Dates of first light and heavy frosts and snow—Continued.

State and station.	First frost.		Snow.	State and station.	First frost.		Snow.				
	Light.	Heavy.			Light.	Heavy.					
<i>Ohio—Cont'd.</i>											
Circleville			3	Frankfort	1						
Cape May C. H.			5	Granville	1						
Dover			3	Greenfield	5						
Friesburg			4	Guysville	17						
Gillette			2	Hackney	2						
Hightstown			3	Jacksonboro	9						
Imlaystown			2	Mountville	3						
Newton			2	New Paris	1						
Oceanic			4	North Royalton	1						
Pensauken			3	Ripley	2						
Readington			3	Rush Creek	2						
River Vale			3	Sharon Center	2						
Tenafly			3	Sidney	1						
Vineland			5	Thurman	2						
Whiting			5	Vanceburg	2						
Woodbine			6	Walnut	4						
<i>New Mexico.</i>											
Albert			5	Waynesville	2						
East Las Vegas			1	Wooster	3						
Gallinas Spring			29	<i>Oklahoma.</i>							
<i>New York.</i>											
Burnett			1	Burnett	1						
Fort Reno			1	Fort Reno	1						
Oklahoma			3	Oklahoma	1						
Ponca			3	<i>Oregon.</i>							
<i>Pennsylvania.</i>											
Ashland			18	Ashland	13						
Williams			5	Williams	14						
<i>Rhode Island.</i>											
Brooksville			3	Blooming Grove	3						
Confluence			2	Brooksville	2						
South Eaton			1	Confluence	2						
<i>Rhode Island.</i>											
Block Island			3	South Eaton	1						
Bristol			5	Block Island	3						
Kingston			5	Bristol	3						
Lonsdale			6	Kingston	3						
<i>Rhode Island.</i>											
Narragansett Pier			5	Lonsdale	3						
Newport			5	Narragansett Pier	3						
Pawtucket			5	Newport	5						
Providence			3	Pawtucket	3						
<i>South Carolina.</i>											
Blenheim			5	Providence	3						
Camden			5	<i>South Carolina.</i>							
Cheraw			3	Blenheim	5						
Columbia			2	Camden	5						
<i>Tennessee.</i>											
Coronaca			3	Cheraw	5						
Flint Hill			5	Columbia	5						
Society Hill			5	<i>Tennessee.</i>							
Tatum Station			2	Coronaca	5						
Tillers Ferry			4	Flint Hill	5						
Wateree			5	Society Hill	5						
<i>Tennessee.</i>											
<i>Tennessee.</i>											
Bronx			3	Bronx	3						
Brenham			7	Brenham	7						
Burnet			2	Burnet	7						
Corpus Christi			3	Corpus Christi	7						
Devine			1	Devine	7						
Hallettsville			1	Hallettsville	5						
Llano			3	Llano	7						
New Braunfels			3	New Braunfels	4						
Orange			3	Orange	4						
San Marcos			3	San Marcos	7						
<i>Utah.</i>											
Richfield			5	Richfield	4						
Saint George			3	Saint George	24						
<i>Virginia.</i>											
Big Stone Gap			16	Big Stone Gap	16						
Blackburg			17	Blackburg	17						
Danville			5	Danville	5						
Warsaw			6	Warsaw	6						

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for December, 1893, as determined by reports from about 2,000 stations, is exhibited on Chart III. In the meteorological tables the total precipitation is given for each station; the departures from the normal are given for regular stations of the Weather Bureau in the table of climatological data. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

NORMAL PRECIPITATION.

In December the monthly precipitation is usually greatest on the north Pacific coast, where it exceeds 10.00; the normal amount exceeds 8.00 along the Pacific coast north of the 38th parallel, in parts of northeastern California, and in a small area of northeastern Louisiana; and exceeds 4.00 from the middle and east Gulf coasts to the middle Ohio valley, along the immediate Atlantic coast from North Carolina to southern New England, and over Nova Scotia and southeastern Maine. Except in parts of the northern plateau region, the monthly precipitation is less than 1.00 over the greater part of the Rocky Mountain and plateau regions, and thence over Kansas, Nebraska, the Dakotas, and Minnesota.

PRECIPITATION FOR DECEMBER, 1893.

In December, 1893, the monthly precipitation exceeded 10.00 at a few points only in eastern Oregon and Washington,

and also at Halifax, N. S.; it was between 4.00 and 6.00 on the western slope of the Rocky Mountains, from northern California to Vancouver Island, and over a portion of Michigan, New York, and New England. It was generally less than 2.00 from the Mississippi Valley westward, and less than 0.5 was reported from Texas, New Mexico, and Arizona.

DEPARTURES FROM NORMAL PRECIPITATION.

The precipitation for December was slightly in excess of the normal in New England, the Lake region, the Dakotas, and northward throughout the Canadian Provinces. It was generally deficient throughout the United States south of latitude 42°. The principal deficits were: 3.5 at Kittyhawk, N. C., and Mobile, Ala.; 3.0 at San Francisco, Cal., and Roseburg, Oreg.; 3.6 at Portland, Oreg.; 2.9 at Galveston, Tex.; 2.7 at Montgomery, Ala. The principal excesses were: 4.6 at Nantucket, Mass.; 5.0 at Halifax, N. S.; 3.6 at Marquette, Mich.; 2.1 at Olympia, Wash.; 2.8 at Edmonton, Alberta; 3.3 at Yarmouth, N. S.

Considered by districts the monthly precipitation for December, 1893, when compared with the normal for the month, furnishes the following percentages (the precipitation is in excess when the percentage of the normal exceeds 100): Extreme northwest, 182; upper lake region, 150; New England, 140; lower lake region, 114; north Pacific coast, 93; south Atlantic states, 84; middle Atlantic states, 82; northern slope, 82; south Pacific coast, 82; Ohio Valley and Tennessee, 75; Missouri Valley, 75; upper Mississippi valley, 71; southern plateau, 71; Key West, Fla., 63; northern

plateau, 59; middle Pacific coast, 58; middle plateau, 56; east Gulf states, 53; southern slope, 43; middle slope, 42; west Gulf states, 37.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for December for a series of years; (2) the length of record during which the observations have been taken and from which the average has been computed; (3) the total precipitation for December, 1893; (4) the departure of the current month from the average; (5) the extremes for December and the years of occurrence during the period of observation:

State and station.	(1) Average for the month of Dec.	(2) Length of record.	(3) Total for Dec., 1893.	(4) Departure from average.	(5) Extremes for December.			
					Greatest.		Least.	
					Am't.	Year.	Am't.	Year.
Arizona.	Inches.	Years.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Fort Apache.	1.05	17	0.10	- 1.55	5.52	1884	0.08	1882
Fort Mohave.	1.37	19	.....	.....	11.17	1889	0.00	*
Whipple Barracks.	1.79	21	0.73	- 1.06	7.38	1889	0.00	*
Arkansas.								
Keesees Ferry.	3.28	12	2.20	- 1.08	11.37	1884	1.15	1889
California.								
Riverside.	1.99	13	2.07	+ 0.08	6.87	1889	0.17	1886
Colorado.								
Las Animas.	0.42	11	0.50	+ 0.08	1.68	1883	0.00	1889
Florida.								
Merritts Island.	2.46	15	2.42	- 0.04	8.55	1888	0.00	1889
Georgia.								
Forsyth.	4.37	19	2.20	- 2.17	7.56	1887	0.79	1889
Idaho.								
Boise Barracks.	2.18	20	0.48	- 1.70	5.96	1871	0.01	1877
Fort Sherman.	3.34	10	4.50	+ 1.16	5.85	1889	1.45	1885
Indiana.								
Lafayette.	2.52	13	3.05	+ 0.53	6.27	1884	0.23	1890
Iowa.								
Cresco.	1.41	22	1.15	- 0.26	3.44	1891	0.30	1874
Kansas.								
Independence.	2.21	21	0.49	- 1.73	5.17	1879	0.49	1893
Louisiana.								
Grand Coteau.	5.25	10	4.70	- 0.55	14.43	1884	2.27	1890
Maine.								
Orono.	3.91	23	4.21	+ 0.30	7.92	1878	1.50	1875
Maryland.								
Cumberland.	2.23	22	0.80	- 1.43	4.50	1881	0.70	1871
Michigan.								
Kalamazoo.	2.76	17	2.79	+ 0.03	7.14	1884	1.35	1890
Missouri.								
Sedalia.	2.01	15	0.87	- 1.14	4.77	1884	0.53	1886
Montana.								
Fort Custer.	0.84	13	0.20	- 0.64	1.87	1883	0.09	1885
Nebraska.								
Fort Robinson.	0.69	10	1.05	+ 0.35	1.97	1883	0.01	1890
Genoa (near).	0.83	18	2.04	+ 1.21	2.04	1893	0.00	1875, '90
Nevada.								
Browns.	0.51	21	.....	.....	2.01	1871	0.00	1872, '76
Carson City.	2.21	16	0.24	- 1.97	5.43	1891	0.00	1876
New Hampshire.								
Hanover.	2.50	22	3.59	+ 1.09	4.69	1878	0.78	1875
New Mexico.								
Deming.	0.40	9	0.10	- 0.30	1.35	1884	0.00	1886, '89
Fort Wingate.	0.93	22	0.78	- 0.78	2.29	1871	0.10	1886
New York.								
Cooperstown.	2.64	22	4.02	+ 1.38	6.02	1881	0.97	1877
Plattsburg Barracks.	1.87	22	3.92	+ 2.05	5.92	1893	0.17	1886
North Carolina.								
Lenoir.	3.60	19	1.20	- 2.40	8.70	1877	0.50	1889
Oklahoma.								
Fort Reno.	1.42	10	1.45	+ 0.04	4.40	1893	0.00	1886
Fort Sill.	1.67	21	2.77	+ 1.10	4.07	1874	0.00	1889
Fort Supply.	0.75	13	0.50	- 0.25	3.19	1885	0.00	1886, '89
Oregon.								
Bandon.	11.56	15	10.86	- 0.70	17.17	1892	4.93	1878
Pennsylvania.								
Dyberry.	2.75	22	3.32	+ 0.57	5.39	1890	1.20	1874
Grampian.	3.59	16	4.10	+ 0.51	5.15	1891	1.36	1892
Wellaboro.	4.35	14	4.21	- 0.14	9.57	1881	0.40	1892
South Carolina.								
Statesburg.	2.82	12	3.81	+ 0.99	5.87	1884	0.75	1889
South Dakota.								
Fort Sully.	0.48	22	0.55	+ 0.07	2.48	1877	0.00	1881
Texas.								
Austin.	3.13	20	0.02	- 3.11	9.00	1891	0.02	1893
Silver Falls.	0.66	6	1.00	+ 0.34	2.03	1891	0.00	1889
Utah.								
Terrace.	0.75	20	0.47	- 0.28	2.12	1877	0.00	1874, '78
Vermont.								
Stratford.	3.18	20	5.30	+ 3.12	5.90	1876	0.15	1875
Virginia.								
Dale Enterprise.	2.79	13	0.54	- 2.25	6.51	1881	0.13	1882
Washington.								
Fort Townsend.	2.80	10	3.24	+ 0.44	5.34	1891	1.14	1879
West Virginia.								
Parkersburg.	2.05	8	2.21	+ 0.16	4.20	1890	0.02	1885
Wisconsin.								
Madison.	1.99	21	1.68	- 0.31	5.73	1884	0.45	1874
Wyoming.								
Fort Washakie.	0.49	10	0.37	- 0.13	2.29	1886	0.00	1890

* Frequently.

PRECIPITATION, JANUARY TO DECEMBER.

For the period January to December, 1893, inclusive, the total precipitation was in excess of the normal by about 15 per cent over the Rocky Mountain plateau regions; it was deficient by 30 and 40 per cent on the southern slope, the Gulf States, and at Key West. In detail the precipitation for the current year, as compared with the normal for this period, furnishes the following percentages (the precipitation is in excess when the percentages of the normal exceed 100): Northern plateau, 123; north Pacific coast, 119; southern plateau, 119; middle Atlantic states, 97; middle plateau, 97; middle Pacific coast, 96; Ohio Valley and Tennessee, 94; lower lake region, 94; extreme northwest, 94; New England, 92; upper lake region, 92; south Atlantic states, 91; upper Mississippi valley, 88; Missouri Valley, 86; east Gulf states, 82; northern slope, 78; southern Pacific coast, 78; west Gulf states, 70; southern slope, 67; middle slope, 62; Key West, Fla., 55.

YEARS OF GREATEST PRECIPITATION FOR DECEMBER.

The precipitation for the current month does not seem to have exceeded the previous record at any of the regular stations of the Weather Bureau.

The greatest precipitation for December occurred generally over the plateau regions in 1889; in the middle and lower Mississippi valleys, the lower Ohio valley, and upper lake region in 1884; on the northern slope of the Rocky Mountains and in the central valleys of California in 1880; in the middle Ohio valley and Tennessee in 1879; over the greater part of New York and New England in 1878; and along the Carolina coast in 1877.

YEARS OF LEAST PRECIPITATION FOR DECEMBER.

The precipitation for the current month does not seem to have fallen below the previous record at any of the regular stations of the Weather Bureau.

The least precipitation for December occurred generally in the Gulf and middle and south Atlantic states, Kentucky, and Tennessee in 1889; in the lower lake region in 1874; and in the Lake Michigan region in 1872.

EXCESSIVE PRECIPITATION.

The following tables for December, 1893, show, by states, the number of stations reporting total precipitation to equal or exceed 10.00 inches during the month; 2.50 in 24 hours, and 1.00 in 1 hour:

Monthly precipitation to equal or exceed 10.00.

State.	Number of stations.	State.	Number of stations.
Washington.	7	Oregon.	3
California.	3		

Precipitation to equal or exceed 2.50 in 24 hours.

State.	Number of stations.	Dates.	State.	Number of stations.	Dates.
California.	12	1, 22, 25, 26, 26-27, 27.	Oregon.	2	1.
Mississippi.	6	29.	Tennessee.	2	2-3, 3.
Alabama.	5	27, 28-29, 29, 29-30.	Colorado.	1	2.
Florida.	5	16, 29-30, 30-31, 31.	Indiana.	1	3.
Georgia.	5	29-30, 30, 30-31.	Kentucky.	1	2-3.
Louisiana.	4	24-25, 29, 30.	Maine.	1	16.
North Carolina.	3	16.	Massachusetts.	1	3-4.
			Minnesota.	1	23-24.

Precipitation to equal or exceed 1.00 in 1 hour.

Louisiana.	3	12, 13.	Mississippi.	1	29.
Arkansas.	1	15.	Texas.	1	24.

Table of excessive precipitation, December, 1893.

State and station.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall 1 inch, or more, in one hour.	
		Amt.	Day.	Amt.	Time.
Alabama.					
Brewton	3.00	27			
Greensboro	2.53	28-29			
Livingston b.	3.49	29-30			
Marion	2.78	29-30			
Pushmataha	2.92	29			
Arkansas.					
Blanchard			1-14	1-10	15
California.					
Arcata	3.21	1			
Crescent City	4.28	1			
Crescent City Lighthouse	10.14				
Deep Creek	2.60	27			
Glendora	2.74	26			
Gormans Station	4.00	26-27			
Green Valley	3.58	27			
Hendersons Ranch	4.00	26-27			
Little Bear Valley	3.39	27			
Little Bear Valley (near)	2.50	25			
Do.	3.70	27			
Morses House	14.73	9-75			
Squirrel Inn	5.18	27			
Upper Mattole	3.00	22			
Colorado.					
Climax	3.00	2			
Florida.					
Archer	3.05	31			
Clermont	4.35	31			
Eustis	2.75	31			
Lake City	2.80	16			
Do.	3.60	30-31			
Tallahassee	3.76	29-30			
Georgia.					
Alapaha	3.98	30-31			
Homerville	3.22	30			
McArthur	4.11	30			
Picola	3.00	29-30			
Poulan	3.94	29-30			
Indiana.					
Marengo	2.50	2			
Franklin	3.22	2-3			
Louisiana.					
Abbeville	2.50	29			
Coushatta b.	2.60	24-25			
Hamburg	3.82	29			
New Orleans		1.00	0 45	12	
Opelousas	2.62	30			
Sugar Experimental Station		1.26	0 30	12	
Wallace		2.10	2 00	13	
Maine.					
Calais	2.56	16			
Massachusetts.					
Lawrence	2.96	3-4			
Wabasha	2.60	23-24			
Mississippi.					
Briers	2.90	29			
Canton	2.80	29			
Crystal Springs	3.75	29			
Enterprise	2.82	29			
Fayette	3.50	29			
Meridian	3.27	29	1-00	1-00	29
Brunswick	2.95	2			
Lewiston	3.95	16			
May	2.64	16			
Weldon	3.05	16			
North Carolina.					
Astoria	12.55				
Bandon	10.86	2-49	1		
Cascade Locks	13.37				
Williams		2.66	1		
Tennessee.					
Florence Station		2.58	2-3		
Riddleton		3.00	3		
Palestine			1-03	1-00	24
Washington.					
Aberdeen	12.18				
East Clallam	11.59				
Elbe	11.16				
Neah Bay	17.46				
Pysht	10.45				
Tatoosh Island	14.28				
Union City	11.86				
Eau Claire		3.40	24		

Received too late for publication in November, 1893.

California.					
Morses House	2.60	18-19			
Redding b.	3.50	20			
Squirrel Inn	5.00	18-19			

MAXIMUM RAINFALL IN ONE HOUR OR LESS.

The following table is a record of the heaviest rainfall during December, 1893, for periods of five and ten minutes and one hour, as reported by regular stations of the Weather Bureau furnished with self-registering rain gauges. This record refers strictly to rainfall; the frequent interruptions of the self-registers, due to snow, explain the numerous cases of incomplete record.

Maximum rainfall in one hour or less.

Station.	Maximum rainfall in—				
	5 min.	Date.	10 min.	Date.	1 hour.
Atlanta, Ga.	0.27	3	0.30	3	0.40
Baltimore, Md.	0.15	16	0.20	16	0.35
Boston, Mass.	0.13	16	0.18	16	0.37
Buffalo, N. Y.	0.05	22	0.10	22	0.16
Cincinnati, Ohio	0.04	3	0.07	3	0.30
Cleveland, Ohio	0.02	15	0.03	15	0.11
Eastport, Me.	0.04	3	0.08	3	0.36
Galveston, Tex.	0.15	3	0.22	3	0.31
Indianapolis, Ind.	0.06	14	0.10	14	0.29
Jacksonville, Fla.	0.11	31	0.13	31	0.35
Jupiter, Fla.	0.15	4-21	0.25	4	0.40
Key West, Fla.	0.15	16	0.18	16	0.34
Memphis, Tenn.	0.15	15	0.25	15	0.55
Nantucket, Mass.	0.11	4	0.20	4	0.40
New Orleans, La.	0.30	12	0.50	12	1.00
New York, N. Y.	0.02	16	0.04	16	0.17
Norfolk, Va.	0.03	5	0.05	5	0.24
Olympia, Wash.	0.03	10	0.05	10	0.25
Philadelphia, Pa.	0.03	3	0.06	3	0.17
Portland, Oregon	0.03	21	0.06	21	0.19
Rochester, N. Y.	0.02	15	0.04	15	0.18
Saint Louis, Mo.	0.18	15	0.20	15	0.31
Salt Lake City, Utah	0.05	2	0.09	2	0.26
San Diego, Cal.	0.07	27	0.10	27	0.32
San Francisco, Cal.	0.07	14	0.11	14	0.31
Savannah, Ga.	0.11	16	0.15	16	0.32
Vicksburg, Miss.	0.26	15	0.41	15	0.68
Washington, D. C.	0.10	16	0.16	16	0.36
Wilmington, N. C.	0.13	16	0.15	16	0.46

* Record incomplete. † Self-register out of order. ‡ Less than 0.05 in 1 hour.

The following tables show the number of years for which monthly precipitation to equal or exceed 10.00 inches, daily precipitation to equal or exceed 2.50 inches, and hourly precipitation to equal or exceed 1.00 inch has been reported in the several states and territories for December during the last 24 years:

Excessive monthly precipitation.

State.	No. years noted.	State.	No. years noted.
Washington	18	Connecticut	0
California	15	The Dakotas	0
Oregon	12	Delaware	0
Texas	8	District of Columbia	0
North Carolina	6	Idaho	0
Louisiana	6	Illinois	0
Florida	4	Indiana Territory	0
Mississippi	3	Iowa	0
Arkansas	3	Kansas	0
Georgia	2	Maine	0
New York	2	Maryland	0
Tennessee	2	Minnesota	0
Alabama	1	Montana	0
Arizona	1	Nebraska	0
Indiana	1	New Mexico	0
Kentucky	1	Ohio	0
Massachusetts	1	Pennsylvania	0
Michigan	1	Rhode Island	0
Missouri	1	South Carolina	0
Nevada	1	Utah	0
New Hampshire	1	Vermont	0
New Jersey	1	West Virginia	0
Virginia	1	Wisconsin	0
Colorado	1	Wyoming	0

Excessive daily precipitation (24 hours).

California	16	Virginia	8
Texas	13	Washington	8
Louisiana	13	Indiana	6
North Carolina	12	Illinois	6
Georgia	11	Ohio	6
Alabama	11	Pennsylvania	6
Oregon	11	South Carolina	6
Tennessee	11	Kentucky	6
Mississippi	11	Arkansas	5
Maryland	11	Maryland	5

Excessive daily precipitation—Continued.

State.	No. years noted.	State.	No. years noted.
New York	5	Utah	1
Massachusetts	4	Vermont	1
Maine	3	Indian Territory	1
Kansas	3	Minnesota	1
Michigan	3	Wisconsin	1
New Jersey	3	The Dakotas	1
Missouri	3	Idaho	1
Arizona	2	Montana	1
Iowa	2	Nebraska	1
District of Columbia	2	Nevada	1
Colorado	2	New Mexico	1
Connecticut	1	Rhode Island	1
Delaware	1	West Virginia	1
New Hampshire	1	Wyoming	1

Excessive hourly precipitation.

State.	No. years noted.	State.	No. years noted.
Texas	8	Delaware	0
California	6	District of Columbia	0
Louisiana	5	Idaho	0
Mississippi	4	Indian Territory	0
Tennessee	3	Iowa	0
Arkansas	3	Kentucky	0
Illinois	2	Maryland	0
Indiana	2	Minnesota	0
Pennsylvania	2	Montana	0
Alabama	2	Nebraska	0
Michigan	2	Nevada	0
Georgia	1	New Hampshire	0
Kansas	1	New Jersey	0
Massachusetts	1	New Mexico	0
Florida	1	New York	1
Maine	1	North Carolina	0
Missouri	1	Ohio	0
Oregon	1	Rhode Island	0
Virginia	1	South Carolina	0
Washington	1	Utah	0
Wisconsin	1	Vermont	0
Arizona	0	West Virginia	0
Colorado	0	Wyoming	0
Connecticut	0		

The following tables give exceptionally heavy monthly, daily, and hourly precipitation reported for December during the last 24 years:

Monthly.

Station and state.	Am't.	Year.	Station and state.	Am't.	Year.
San Andreas, Cal.	51.05	1871	Georgetown, Cal.	22.94	1880
Pilarcitos, Cal.	41.87	1871	Grass Valley, Cal.	22.69	1888
Feiton, Cal.	34.95	1889	Laurel, Cal.	22.66	1892
Mount Hamilton, Cal.	33.84	1884	Neah Bay, Wash.	22.57	1887
Reeds Camp, Cal.	33.07	1880	Do	22.09	1890
Laurel, Cal.	31.79	1889	Vacaville, Cal.	21.85	1886
Emigrant Gap, Cal.	31.20	1884	Colfax, Cal.	21.85	1880
Neah Bay, Wash.	30.70	1886	Pysht, Wash.	21.61	1886
Upper Mattole, Cal.	29.36	1889	Fort Stevens, Oregon	21.27	1880
Mount Saint Helena, Cal.	28.91	1880	American Hill, Cal.	21.22	1889
Summit, Cal.	28.88	1871	Boulder Creek, Cal.	21.11	1862
Cisco, Cal.	28.30	1871	Grass Valley, Cal.	21.08	1889
Sims, Cal.	26.92	1862	Iowa Hill, Cal.	21.04	1889
Crescent City, Cal.	26.26	1885	San Rafael, Cal.	20.96	1884
Tatoosh Island, Wash.	25.84	1886	Emigrant Gap, Cal.	20.85	1889
Delta, Cal.	25.83	1889	Los Gatos, Cal. 6.	20.73	1889
Cisco, Cal.	25.57	1889	Crescent City, Cal.	20.58	1889
Do	25.05	1884	Dunsmuir, Cal.	20.58	1889
Edmonton, Cal.	24.95	1893	Healdsburg, Cal.	20.42	1871
Upper Mattole, Cal.	24.48	1892	Point Pleasant, La.	20.39	1884
Mumford Hill, Cal.	24.34	1890	Santa Cruz, Cal.	20.36	1889
Neah Bay, Wash.	23.91	1891	Portland, Oregon	20.14	1882
Colfax, Cal.	23.60	1884	Tatoosh Island, Wash.	20.08	1891
Neah Bay, Wash.	23.22	1880	Cathlamet, Wash.	20.00	1875

Daily (24 hours).

Station and state.	Amount.	Date.	Station and state.	Amount.	Date.
Upper Mattole, Cal.	Inches.	22-24, 1892	Point Pleasant, La.	8.03	26-30, 1884
Point Pleasant, La.	16.93	22-24, 1892	College Station, Tex.	7.78	12-14, 1891
Monroe, La.	13.50	19, 1882	Portland, Oregon	7.06	12-13, 1882
Edmonton, Cal.	12.15	29-30, 1884	Middletown, Cal.	7.57	23-24, 1892
San Rafael, Cal.	11.71	23-25, 1892	Pikes Peak, Colo.	7.39	5-6, 1892
Mount Ida, Ark.	11.45	17-21, 1884	Edmonton, Cal.	7.06	2-3, 1892
Cloverdale, Cal.	10.35	26-30, 1884	Madding, Ark.	7.06	12, 1892
Morses House, Cal.	10.10	23-24, 1892	Point Pleasant, La.	7.02	8-9, 1876
Mount St. Helena, Cal.	9.75	27, 1893	New Gascony, Ark.	6.66	12-13, 1892
Shasta Springs, Cal.	9.04	23-24, 1880	Mount St. Helena, Cal.	6.65	2-3, 1890
Clarksville, Tex.	8.75	22-24, 1892	Fort Gaston, Cal.	6.66	24-25, 1883
Do	8.50	29-30, 1874	Pine Bluff, Ark.	6.60	12-13, 1892
Yaquna L. H., Oregon.	8.47	26-29, 1876	Fouts Springs, Cal.	6.44	23-24, 1892
Los Gatos, Cal.	8.45	23-24, 1892	Micco, Fla.	6.33	24, 1888

Excessive daily precipitation—Continued.

Station and state.	Amount.	Date.	Station and state.	Amount.	Date.	
Bandon, Oregon	Inches.	6.32	21-22, 1892	Merritts Island, Fla.	5.39	17, 1888
Fort Meade, Fla.	6.20	17, 1888	Fort Barrancas, Fla.	5.35	3-4, 1877	
Farmerville, La.	6.15	5, 1890	Searcy, Ark.	5.33	12-13, 1892	
Gardiner, Oregon	6.07	20-21, 1892	Fort Barrancas, Fla.	5.32	20, 1881	
Minden, La.	6.02	23, 1891	Austin, Tex.	5.31	11-12, 1891	
Fayetteville, N. C.	6.00	9-10, 1878	Highlands, N. C.	5.30	20, 1881	
Do	6.00	20-21, 1878	Titusville, Fla.	5.28	17, 1888	
Clarksville, Tex.	6.00	31-Jan. 1,	Trinity, Ala.	5.20	4, 1857	
		1874-75	Squirrel Inn, Cal.	5.18	27, 1893	
Hydesville, Cal.	6.00	22-23, 1892	Nordhoff, Cal.	5.17	23-25, 1892	
Olympia, Wash.	5.95	20-22, 1892	Osceola, Ark.	5.05	30-31, 1892	
Hallettsville, Tex.	5.93	11-12, 1891	Camden, Ala. 6.	5.05	12, 1892	
Mount St. Helena, Cal.	5.73	19-20, 1880	Vicksburg, Miss.	5.05	18-19, 1872	
Louisville, Ill.	5.70	3, 1873	Red Bluff, Cal.	5.04	19, 1879	
New Ulm, Tex.	5.62	3, 1875	Boyd's Corners, N. Y.	5.02	11, 1878	
Stuttgart, Ark.	5.61	12-13, 1892	Point Pleasant, La.	5.01	14, 1884	
Neah Bay, Wash.	5.45	16-17, 1897	Ellsworth, N. C.	5.00	1-2, 1880	
Fort Barrancas, Fla.	5.43	5, 1879	Melissa, Tex.	5.00	27-28, 1877	

One hour and less.

Station and state.	Amount.	Time.
New Orleans, La.	Inches.	h. m.
Tampa, Fla.	0.30	0 05
New Orleans, La.	0.30	0 05
Atlanta, Ga.	0.30	5 1890
Vicksburg, Miss.	0.27	0 05
Jupiter, Fla.	0.26	0 05
Norfolk, Va.	0.25	0 05
Savannah, Ga.	0.25	4 1891
Galveston, Tex.	0.25	8 1890
Tampa, Fla.	0.20	0 05
New Orleans, La.	0.20	26, 1892
Galveston, Tex.	0.20	20, 1892
Wellsboro, Pa.	1.36	20
Winnebago, Ill.	1.20	7, 1884
	1.00	0 20
		21, 1889

MONTHLY SNOWFALL.

The depth of snow that fell during the month of December, as reported by both regular and voluntary observers, is shown by the lines and figures on Chart VI, which also gives, by the full line, the limit at which minimum temperatures of 32° F. were at any time reported at the regular Weather Bureau stations; by the dotted line is given a similar limit for 40°. These air temperatures within Weather Bureau shelters are, of course, higher than would be given by thermometers exposed in the open air. The line of 40° within a shelter usually marks the limit of frosts on the open surface of the ground. The date of the first snow is given in the table of dates of first frost on p. 350.

DEPTH OF SNOW ON GROUND.

The depth of unmelted snow lying on the ground at 8 p. m. Monday of each week during the winter season is shown by a series of weekly maps published by the Weather Bureau, beginning with Monday, December 4, 1893, based upon telegraphic reports received from a comparatively few selected stations. These maps may be summarized as follows:

On Monday, December 1, 12 inches lay over Upper Michigan, the northern portion of Lower Michigan, and the Canadian shores on the north side of lakes Huron and Superior; there were also 12 inches in central Iowa; the line of zero passed from Nova Scotia southwest through New York, N. Y., Harrisburg and Pittsburgh, Pa., Cincinnati, Ohio, Saint Louis and Kansas City, Mo., Valentine, Nebr., Fort Buford, N. Dak., Havre and Helena, Mont., and Spokane, Wash.

On Monday, December 11, 25 inches lay in Upper Michigan near Sault Ste. Marie, 15 inches in central Iowa, and 9 inches in western Maine; the line of zero passed from the coast of Nova Scotia to the coast of Connecticut through central Pennsylvania, northern Ohio, Indiana, Illinois, Missouri, eastern Kansas, the northern border of Wyoming, and western Montana.

On Monday, December 18, 40 inches lay near Marquette, Mich., and 9 inches in northern Vermont, New Hampshire, and western Maine, and the zero line passed from Nova Scotia southwest to Cape Cod, northern Pennsylvania, central Ohio, northern Illinois, Missouri, eastern Nebraska, and the central portion of Montana.

On Monday, December 25, 6 inches or more of snow covered northern New England. The southern limit of snow passed from northeastern Massachusetts to northern New York, thence through central Michigan and northern Illinois westward to northern Colorado and Nevada, being considerably farther south than the week previous. Ten inches or more of snow lay on the ground at the Straits of Mackinaw, central and northern Wisconsin, and the upper Peninsula of Michigan. Thirty-seven inches were reported at Marquette, Mich., and 23 at Sault Ste. Marie, Mich.

On Monday, January 1, 38 inches were reported at Marquette, Mich., 26 at Sault Ste. Marie, Mich., 12 at Green Bay, Wis., and 11 at Portland, Me. The zero snow line had moved southward over New York, southern New England, and southern Michigan.

The accompanying chart, No. VII, gives the depth, in inches, of snow lying on the ground on December 31 at several hundred stations, selected from among many hundred that report the presence of more or less snow. The irregularities of local distribution are so great that it seems hardly practicable to draw lines of equal snow depth, and yet an attempt has been made to indicate the zone where a trace of snow is still left on the ground. The line of 5-inch depth has also been drawn through regions where reports are sufficiently numerous to indicate that the general average depth is not less than that amount. The maximum depths on the ground are: Climax, Colo., 65; Belfast and Calais, Me., 30; Easton, Me., 36; Calumet, Mich., 39; Marquette, Mich., 37; Berlin Mills, N. H., 19; Butternut, Wis., 30.

The accompanying table of total snowfall shows also the depth of snow on the ground on the 15th and 31st of the month:

Snowfall of 10 inches or more, December, 1893, with amounts on ground on the 15th and at the close of the month.

State and station.	Total.	15th.	31st.	State and station.	Total.	15th.	31st.
<i>Arizona.</i>	<i>Inches.</i>	<i>Ins.</i>	<i>Ins.</i>	<i>Connecticut.</i>	<i>Inches.</i>	<i>Ins.</i>	<i>Ins.</i>
Flagstaff.....	18.0	.....	.....	Bridgeport.....	12.4	4.3	0.8
<i>California.</i>				Canton.....	15.0	9.0	1.5
Boca.....	16.0	.....	.....	Colchester.....	22.0	15.0	2.0
Cisco.....	44.0	.....	.....	Falls Village.....	16.5	5.0	2.0
Deep Creek.....	22.0	.....	.....	Greenfield Hill.....	13.0	4.8	1.8
Edmonton.....	27.0	13.0	10.0	Hartford b.....	17.0	7.0	2.0
Georgetown.....	16.0	.....	T.	Lebanon.....	22.0	16.0	1.5
Gorman Station.....	20.0	.....	.....	Middletown.....	15.8	9.0	2.0
Green Valley.....	42.1	.....	.....	New Hartford a.....	17.0	3.0	10.0
Hendersons Ranch.....	21.0	.....	.....	New Haven.....	13.6	5.6	1.3
Little Bear Valley.....	35.5	.....	.....	New London.....	13.6	4.6	2.9
Little Bear Val'y near).....	32.5	.....	.....	North Grosvenor Dale.....	15.0	2.0	2.0
Lower Holcomb Valley.....	25.8	.....	.....	Norwalk b.....	11.0	4.0	1.5
Morris House.....	45.0	.....	.....	Southington.....	14.5	.....	.....
Squirrel Inn.....	30.0	.....	.....	South Manchester.....	17.0	7.0	2.0
Summit.....	60.0	.....	.....	Storrs.....	13.5	.....	.....
Tehachapi a.....	21.0	.....	.....	Voluntown.....	20.0	.....	.....
Tehachapi b.....	17.0	0.0	4.0	Wallingford.....	11.5	.....	.....
Towles.....	17.0	.....	.....	Watertown.....	15.0	2.0	2.0
Truckee.....	17.0	.....	.....	West Simsbury.....	16.0	8.0	1.0
Tunnel No. 2.....	21.5	.....	.....	<i>Idaho.</i>			
<i>Colorado.</i>				Fort Lemhi.....	11.0	3.5	.....
Breckenridge.....	85.2	45.0	36.0	Garden Valley.....	12.0	.....	.....
Byers.....	10.5	.....	.....	Kootenai.....	14.0	.....	.....
Climax.....	78.5	60.0	65.0	Lake.....	33.5	.....	.....
Colibran.....	21.0	3.2	8.0	Murray.....	22.0	.....	.....
Como (near).....	15.0	1.0	1.0	<i>Illinois.</i>			
Glenwood Springs.....	18.0	3.0	2.5	Aurora b.....	13.5	0.0	0.0
Gold Hill.....	7.5	5.0	10.0	Chicago.....	12.1	T.	0.0
Lay.....	12.8	2.0	5.0	East Peoria.....	18.0	0.0	0.0
Pagoda (near).....	17.0	4.0	7.0	Galva.....	13.5	T.	0.0
Paonia.....	12.0	0.0	5.0	Monmouth.....	13.0	0.0	0.0
Pikes Peak.....	25.2	T.	T.	Oswego.....	11.0	0.0	0.0
Rico.....	15.3	.....	.....	Ottawa.....	16.2	T.	0.0
River Bend.....	12.0	.....	.....	Peoria b.....	10.0	0.0	0.0
San Luis.....	10.1	.....	.....	Ranton.....	10.4	0.0	0.0
Scissors.....	12.0	0.0	4.0	Rockford.....	17.5	0.0	0.0
Stamford.....	10.5	.....	.....	Sycamore.....	10.0	5.0	0.0
Steamboat Spring.....	37.5	12.0	22.0	Walnut.....	11.5	0.0	0.0
Surface Creek.....	11.7	2.0	2.0	<i>Indiana.</i>			
T. S. Ranch.....	11.0	.....	.....	Angola.....	20.4	.....	10.0
Twin Lakes.....	42.0	.....	.....	Delhi.....	10.5	T.	T.

Snowfall of 10 inches or more—Continued.

State and station.	Total.	15th.	31st.	State and station.	Total.	15th.	31st.
<i>Indiana—Cont'd.</i>	<i>Inches.</i>	<i>Ins.</i>	<i>Ins.</i>	<i>Michigan—Cont'd.</i>	<i>Inches.</i>	<i>Ins.</i>	
Hawpatch.....	15.0	0.0	0.0	Charlevoix.....	33.4	.....	.....
Huntington.....	12.8	2.0	T.	Cheboygan.....	35.0	20.0	24.0
Logansport a.....	11.2	0.0	0.0	Clinton.....	15.3	0.0	0.5
Logansport b.....	10.0	0.0	0.0	Crystal Falls.....	30.5	22.0	.....
South Bend.....	22.5	0.0	0.5	Detroit.....	16.6	1.0	T.
Valparaiso.....	11.0	0.0	0.0	Escanaba.....	14.6	.....	.....
<i>Iowa.</i>				Fitchburg.....	27.5	0.0	1.0
Carroll.....	12.5	4.0	0.0	Flint.....	15.7	0.0	0.0
Cedar Rapids.....	15.4	6.5	T.	Gaylord.....	66.5	42.0	16.0
Des Moines.....	11.9	5.8	T.	Grand Haven.....	18.9	2.0	1.0
Greenfield.....	15.4	3.0	0.0	Grand Rapids.....	27.4	6.0	1.5
Iowa City.....	11.8	3.0	0.0	Grape.....	14.5	0.0	0.5
Kosciusko.....	10.5	0.0	0.0	Grayling.....	31.1	0.0	0.1
Muscatine.....	13.1	0.0	0.0	Hanover.....	16.2	0.0	T.
Newton.....	12.0	6.0	0.0	Harbor Springs.....	43.0	34.0	23.0
Richland.....	14.8	4.0	0.0	Harrison.....	14.0	14.0	1.0
Seymour.....	14.5	1.5	0.0	Harrisonburg.....	35.5	.....	.....
Tipton.....	13.5	10.0	.....	Hastings.....	25.0	.....	.....
West Bend.....	12.6	2.8	0.0	Highland Station.....	10.0	.....	.....
<i>Maine.</i>				Howell.....	15.8	5.0	T.
Bar Harbor.....	33.6	12.0	7.0	Jeddo.....	12.5	T.	0.5
Belfast.....	41.0	15.0	30.0	Kalamazoo.....	23.5	0.0	0.2
Calais.....	49.0	20.0	.....	Lake City.....	39.0	24.0	6.0
Cornish.....	27.0	.....	.....	Lansing.....	17.5	0.0	0.0
East Machias.....	24.0	8.0	3.0	Lathrop.....	35.5	20.0	24.0
Easton.....	45.0	15.0	36.0	Lewiston.....	22.0	11.0	.....
Eastport.....	21.5	6.5	1.8	Lodi.....	26.0	10.0	14.0
Fairfield.....	28.0	12.0	14.0	Madison.....	13.5	2.0	0.3
Farmington.....	35.0	.....	.....	Marquette.....	58.5	35.1	37.4
Fort Kent.....	10.0	.....	.....	Mayville.....	10.0	.....	.....
Gardiner.....	31.5	15.0	16.0	Mio.....	24.0	10.0	.....
Houlton.....	34.7	.....	.....	Motiville.....	13.9	5.0	0.5
Indian Stream.....	18.5	11.0	19.0	Olivet.....	30.5	6.0	0.0
Lewiston.....	35.2	.....	.....	Parkville.....	16.0	0.0	1.0
North Bridgton.....	26.5	13.0	14.0	Port Huron.....	14.4	0.0	0.7
Orono.....	34.5	.....	.....	Rockland.....	40.5	38.0	.....
Portland.....	30.3	14.6	11.3	Saint Ignace.....	29.8	16.0	16.0
<i>Massachusetts.</i>				Sand Beach.....	10.0	.....	.....
Amherst.....	16.0	.....	.....	Sault Ste. Marie.....	26.4	29.3	23.5
Amherst Ex. Station a.....	15.2	8.0	4.0	Thornville.....	19.0	7.0	0.0
Amherst Ex. Station b.....	14.8	.....	.....	Vandalia.....	22.0	3.0	1.5
Bedford.....	14.2	12.0	2.0	Williamston.....	15.0	0.0	1.0
Beverly Farms.....	21.0	11.0	5.0	Ypsilanti.....	16.7	1.0	0.3
<i>Michigan.</i>				<i>Minnesota.</i>			
Ada.....	16.0	.....	.....	Ada.....	15.0	33.0	26.0
Algonac a.....	11.8	4.0	1.0	Alexandria a.....	11.8	4.0	11.0
Alexandria b.....	12.0	8.0	0.0	Belle Plaine.....	10.5	6.0	14.0
Caledonia.....	10.0	9.0	.....	Caledonia.....	7.3	10.0	T.
Cambridge.....	20.5	8.5	.....	Cambridge.....	15.5	7.0	15.0
Chestnut Hill.....	16.0	6.0	2.5	Camden.....	8.0	4.0	12.0
Concord a.....	19.2	.....	.....	Clear Lake.....	18.0	.....	.....
Dudley.....	10.8	4.2	0.8	Crookston a.....	9.6	2.6	11.8
East Templeton.....	15.5	5.2	2.0	Collegeville.....	11.6	.....	.....
Fall River a.....	19.0	8.0	4.0	Cromwell.....	9.0	16.0	16.0
Fitchburg a.....	17.0	8.0	3.0	Daassel.....	14.0	12.0	14.0
Fitchburg b.....	15.5	8.0	2.0	Dawson.....	10.9	4.4	10.0
Gilbertville.....	20.0	7.0	2.0	Duluth.....	20.5	12.0	4.5
Groton a.....	16.0	10.0	4.0	Farmington.....	17.2	16.0	10.0
Hingham.....	16.5	.....	.....	Fort Ripley.....	12.0	.....	.....
Kendall Green.....	14.0	.....	.....	Grand Meadow.....	11.0	6.0	1.0
Lawrence.....	19.0	8.0	5.0	Granite Falls.....	10.0	2.0	10.0
Leeds.....	15.0	8.0	5.0	Hutchinson.....	11.0	8.0	12.0
Leominster.....	13.5	8.0	1.5	Lake Winnibigoshish.....	11.6	14.0	12.0
Ludlow Center.....	14.2	5.0	2.0	Leech Lake.....	14.8	10.0	14.0
Mansfield.....	17.5	6.0	3.0	Long Prairie.....	11.0	10.0	13.0
Middleboro.....	14.0	4.5	3.0	Maple Plain.....	19.4	12.0	14.0
Milton.....	19.5	5.0	4.0	Marfield.....	20.0	23.0	25.0
Monroe.....	35.0	12.0	7.0	Minneapolis (W. B.).....	12.4	12.0	16.0
Monson.....	15.0	6.0	2.0	Minneapolis b.....	14.0	11.0	10.0
Mount Nonotuck.....	19.2	10.0	3.0	Minneapolis c.....	12.8	10.0	6.0
New Bedford a.....	20.5	8.5	.....	Minneapolis City.....	9.5	10.0	5.0
New Bedford b.....	17.5	8.0	0.5	Moorehead.....	16.1	16.3	3.6
North Billerica.....	20.0	6.0	3.0	Morris.....	13.0	4.0	12.0
Randolph.....	18.0	3.0	4.0	North Branch.....	19.0	12.0	16.0
Roxbury.....	18.0	.....	.....	Park Rapids.....	8.5	.....	14.0
Royalston.....	12.5	.....	.....	Pine River.....	14.0	11.0	12.0
Taunton d.....	21.2	3.0	3.5	Pokagon Falls.....	11.9	2	

Snowfall of 10 inches or more—Continued.

State and station.	Total.	15th.	31st.	State and station.	Total.	15th.	31st.
<i>New Hampshire—Cont'd.</i>				<i>Ohio—Cont'd.</i>			
Bethlehem	22.0	12.0	4.0	Weymouth	16.0	T.	T.
Brookline	14.7	10.0	11.0	Wheeler	35.0		
Concord	19.0	15.0	10.0	<i>Oregon.</i>			
Dublin	17.5	5.0	2.0	Lakeview	12.0	0.0	0.0
East Canterbury	22.8	13.0	10.0	Siskiyou	17.0		
Grafton	27.7	12.0	8.0	Sparta	21.0	2.0	9.0
Hanover	22.6	11.0	7.0	<i>Pennsylvania.</i>			
Keene	21.0	8.0	6.0	Blue Knob	14.7		2.5
Lancaster	20.5	6.0	10.0	Clarion	16.6	2.0	1.2
Littleton	25.5	16.0	10.0	Coatesville	10.5	0.0	0.0
Newton	21.0	8.0	6.0	Confluence	13.0	0.0	0.0
North Conway	30.0			Dubois	12.0	0.0	0.0
Peterboro	22.2	8.0	4.0	Dyberry	19.2	11.0	4.0
Plymouth	22.5	16.0	14.0	Edinboro	16.0	8.0	2.0
Sanbornton	21.0	11.0	10.0	Emporium	15.3	0.0	1.0
Stratford	25.0	10.0	8.0	Erie	10.0	0.0	1.0
West Mil.	32.0	8.0	20.0	Girardville	14.8	0.0	3.0
<i>New Jersey.</i>				Grampian	14.0	0.0	0.0
Franklin Furnace	13.5	4.0	1.0	Honesdale	23.5	0.0	3.0
Newton	11.0		2.0	Lebanon	10.0	0.0	1.0
<i>New Mexico.</i>				Le Roy	10.2	2.5	0.8
Chama	16.0	4.0	9.0	Oil City	16.5	0.0	0.0
<i>New York.</i>				Saegerstown	15.3		0.5
Addison	10.6		0.5	Salem Corners	18.2	0.0	3.0
Albany	12.4	2.0	2.0	Shinglehouse	21.9		
Alfred Center	18.0			Smythport	26.0	0.0	0.0
Angelia	19.5	3.0	1.0	Warren	12.0	2.0	2.0
Arcade	24.7	3.0	1.0	Wellsboro	14.5	6.5	0.5
Baldwinville	15.0	6.0	3.0	Wilkesbarre	16.5		3.0
Binghamton	16.5	4.0	3.0	<i>Rhode Island.</i>			
Brookfield	28.0	2.1	1.0	Bristol	18.5	11.0	3.0
Buffalo	30.8	4.0	1.2	Kingston	17.5	7.0	4.0
Cooperstown	21.0	T.	1.5	Londondale	17.0	5.0	3.0
Eden Center	39.0	0.0	3.0	Narragansett Pier	15.0		
Factoryville	17.2	0.0	1.2	Pawtucket	16.5	6.0	3.0
Friendship	16.5	4.0	0.8	Providence	14.0	6.0	2.0
Gloversville	21.3	12.0	5.0	Providence	14.5	5.0	3.0
Hess Road Station	12.5	4.0	3.0	<i>South Dakota.</i>			
Honeymead Brook	18.2	T.	2.5	Aberdeen	14.0	10.0	2.0
Humphrey	31.0	0.0	1.0	Alexandria	10.0	3.0	6.0
Ithaca	15.6	1.0	1.0	De Smet	12.0	3.0	6.0
Lebanon Springs	17.6	3.0	4.0	Faulkton	11.0		6.0
Le Roy	30.0	T.	3.0	Forestburg	15.8	1.0	13.2
Lockport	17.0	6.0	2.0	Frankfort	12.0	4.0	5.0
Lowville	34.0	12.0	3.0	Gary	10.0	3.0	4.0
Lyon	21.5			Huron	10.1	5.0	5.8
Madison Barracks	12.8			Oelrichs	13.0		
Malone	31.5	10.0	25.0	Parker	14.5	2.0	6.0
Middletown	15.8			Rosebud	16.0	3.0	6.0
New Lisbon	25.5	10.0	1.2	Sioux Falls	14.0	8.5	6.5
North Hammond	21.3	0.0	6.0	Spearfish	13.0	2.0	3.0
Number Four	37.1	16.0	3.5	Watertown	10.0	5.0	8.0
Ogdensburg	16.0	4.0	3.0	Webster	16.9	3.0	4.0
Oswego	24.0	4.5	1.7	Wessington Springs	19.5	6.0	12.0
Oxford	18.4	T.	1.0	Whitewood	11.2		3.2
Palermo	15.0			Wolsey	14.5	3.0	11.0
Plattburg Barracks	15.4			<i>Utah.</i>			
Port Jervis	16.5	10.0		Castle Gate	14.5		
Postdam	27.0			Heber	28.0		12.0
Poughkeepsie	15.3	6.5	2.0	Levan	13.5	1.0	7.0
Rochester	27.6	5.3	2.6	Losee	13.0		9.0
Romulus	12.6	2.8	0.5	Ogden a	15.0		
Rondont	19.5			Ogden b	11.2		1.0
Saranac Lake	19.0	10.0		Richfield	10.4	6.8	3.0
Setauket	11.5	5.0	2.5	Salt Lake City	10.5	0.1	3.0
South Canisteo	12.5			Scofield	16.7	6.0	9.0
Stillwater	20.0	6.0	3.0	Singletree	12.0		12.0
Turin	43.9	14.0	2.0	Thistle	12.0		
Varysburg	19.4	0.0	1.0	<i>Vermont.</i>			
Wappinger Falls	18.8	6.0	1.0	Brattleboro	21.0		
Wedgewood	12.0	3.0	T.	Burlington	19.0	7.0	1.0
<i>North Dakota.</i>				Cornwall	23.0	12.0	0.0
Bismarck	14.5	9.6	7.0	Enosburg Falls	28.0	10.	4.0
Williston	23.0	12.8	8.0	Hartland	25.0	18.0	11.0
<i>Ohio.</i>				Irasburg	32.8		
Ashland	10.5	T.	T.	Jacksonville	26.4	4.0	2.0
Auburn	11.7	3.0	T.	Northfield	22.5	12.5	5.4
Hement	15.0	0.0	0.5	Norwich	21.0	10.5	9.5
Bimola	16.0	0.0	0.5	Strafford	32.0	18.0	12.0
Bissells	19.4	T.	0.7	Wells	20.2	8.0	3.0
Cleveland (W. B.)	17.9	0.0	0.1	Woodstock	27.0	15.5	11.5
Cleveland (V. O.)	17.7	0.0	0.5	<i>Washington.</i>			
Colebrook	13.0	0.0	1.0	Hunters	18.0		
Elyria	15.9			Pleasant Hill	16.0	0.7	3.5
Findlay	12.5	6.0	T.	West Virginia.			
Fostoria	11.2	0.0	T.	Amherst	11.0	17.0	13.5
Garrettsville	15.3	0.0	T.	Barron	23.0	19.0	
Harbor	23.5	0.0	1.0	Beaver Dam	10.5	4.0	T.
Hedges	11.5	0.0	T.	Belleville	9.5	13.0	T.
Hillhouse	17.2	0.0	0.2	Black River Falls	13.2	24.0	9.2
Hiram	12.0	0.0	0.5	Butternut	25.0	18.0	30.0
Lordstown	10.5	0.0	0.5	Cadiz	7.3	18.0	0.0
Mansfield	12.0	0.0	7.0	Centralia	24.0	16.0	
Montpelier	20.7	14.0	1.0	Chippewa Falls	27.5		
Napoleon	15.5		0.5	City Point	9.0	22.0	11.0
North Royalton	11.5	0.0	0.0	Columbus	7.0	18.0	0.0
Orangeville	12.5	0.0	1.0	Grandon	20.9	23.0	24.0
Ridgeville Corners	14.0	0.6	0.0	Depere			13.0
Sandusky	12.3	0.0	T.	Eau Claire	17.0	3.0	14.0
Shenandoah	10.5	0.0	0.2	Estella	24.5	16.0	10.0
Sylvania	16.0	0.0	1.5	Florence	29.1	?	?
Tiffin	14.0	0.0	T.	Fond du Lac	13.0	10.0	3.0
Toledo	16.1	0.0	0.1	Grantsburg	22.0	12.0	18.0
Vernillion	16.0	0.0	0.5	Green Bay	26.5	15.4	12.3
Vickery	20.9	0.0	T.	Hartford	11.2	8.0	3.0
Warren	12.1	0.0	0.7	Harvey	13.9	7.0	1.8
Wauseon	18.8	T.	0.2	Hayward	20.5	18.0	26.0
Wellington	20.3	0.0	0.0				

Snowfall of 10 inches or more—Continued.

State and station.	Total.	15th.	31st.	State and station.	Total.	15th.	31st.
<i>Wisconsin—Cont'd.</i>				<i>Wisconsin—Cont'd.</i>			
Hillsboro	8.0	12.0	1.0	Oshkosh	15.3	?	5.0
Janesville	6.0	12.0	0.0	Pepin	12.0	11.0	0.0
Juneau	10.6		1.5	Raymond	10.0	5.5	1.0
Koepenick	19.5	20.0	18.0	Sharon	7.5	10.0	1.5
Lancaster	9.0	11.0	T.	Shawano	16.0	15.0	12.0
Lincoln	21.0			Stevens Point			13.0
Madison	7.3	10.0	0.0	Valley Junction	10.0	10.0	4.0
Manitowoc	16.5	T.	12.0	Viroqua	8.2	13.0	0.0
Meadow Valley	11.5	18.0	6.0	Watertown	12.0	8.0	
Medford a	27.0			Waukesha	10.6		
Medford b	21.5	18.0	16.0	Westfield	19.0	10.0	6.0
Menomonie	16.9	18.0	15.0	Weston	18.1	18.5	16.0
Milwaukee	10.1	2.0	0.5	Whitehall	10.5	13.0	9.5
Neillsville	28.0	24.0	15.0	<i>Wyoming.</i>			
New Holstein	16.4	12.0	0.0	Fort McKinney	11.0		
Oconomowoc	8.0	14.0	0.0	Fort Yellowstone	20.2		
Oconto	22.6		15.0	Saratoga	11.0		
Osceola	16.0	12.0	16.0	Sundance	10.5		

HAIL.

Description of the more severe hailstorms of the month is given under "Local storms." Hail was reported as follows: 3d, South Carolina. 5th, Rhode Island. 10th, Nebraska. 12th, Washington. 13th, Oregon. 14th, California and Utah. 15th, Mississippi and Texas. 20th, Oregon. 22d, California. 23d, Arizona. 24th, California, Iowa, Missouri, and Nebraska. 25th, Pennsylvania. 26th and 27th, California. 29th, Mississippi.

6th, Mississippi, Nebraska, and Rhode Island. 7th, Iowa and South Dakota. 8th, Iowa, Minnesota, South Dakota, and Wisconsin. 9th, Illinois, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, New York, Ohio, Pennsylvania, and Wisconsin. 10th, Idaho, Nebraska, and Washington. 11th, Washington and Wisconsin. 12th, Kentucky, Massachusetts, Missouri, New York, Vermont, Washington, and Wisconsin. 13th, Illinois, Minnesota, New York, Ohio, and Washington. 14th, Arizona, Connecticut, Indiana, Iowa, Maryland, Massachusetts, Michigan, Minnesota, Nebraska, Nevada, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Vermont, Virginia, Washington, and Wisconsin. 15th, Connecticut, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, South Carolina, Vermont, Washington, and Wisconsin. 16th, Maine, Massachusetts, Michigan, New Hampshire, New York, and Vermont.

17th, Kentucky, Maine, and Massachusetts. 18th, Minnesota, Mississippi, and New Jersey. 19th, Indiana and Maryland. 20th, Washington. 21st, Montana. 22d, California, Maryland, Michigan, Minnesota, Nevada, Utah, Vermont, and Wisconsin. 23d, Arizona, Kentucky, Maine, Nebraska, New Hampshire, New Jersey, New York, South Dakota, Vermont, and Wisconsin. 24th, California, Colorado, Iowa, Minnesota, Missouri, Nebraska, Nevada, South Dakota, and Wisconsin. 25th, Iowa, Minnesota, Mississippi

Michigan, New Hampshire, New York, Ohio, and Wisconsin. 26th, Nevada and Ohio. 27th, Illinois, Iowa, Kentucky, Minnesota, Missouri, Nebraska, Nevada, and Wisconsin. 28th, Delaware, Maryland, Michigan, New Jersey, New York, Pennsylvania, and Wisconsin. 29th, Nebraska, Ohio, South Dakota, and Utah. 30th, Arkansas, Maryland, New Jersey, New York, Ohio, Oregon, Pennsylvania, South Dakota, and Tennessee. 31st, Alabama, Connecticut, New Jersey, Ohio, Oregon, and Pennsylvania.

FOG.

Few special reports of fog over the Lakes have been received, but the general heavy fogs of December 15, 16, 22, and 23 in the lower lake region seriously interfered with the working of overhead telegraph lines on those dates.

WET AND DRY SEASONS.

The character of the season as to precipitation in its relation to agriculture is shown in the following extracts and reports:

Alabama.—The periods of general rain were 1st to 3d, 6th to 9th, 13th to 16th, 29th to 31st.

Colorado.—Large excess of snow on the mountains, but deficiency of rain at low stations and in the extreme eastern, southern, and southeastern counties.

Florida.—Extensive frosts on the 19th and minor frosts on ten other days; these frosts were beneficial to the orange crop and did but little damage to garden truck and tender vegetation.

Georgia.—Unusually warm and pleasant December with deficiency of rain; the alternate freezing and thawing, accompanied by occasional showers, has rendered the soil moist and in excellent condition for agricultural purposes.

Iowa.—During a considerable portion of the month the larger part of the state was covered with sufficient snow to make good sleighing; at the close of the month the ground was generally bare; winter wheat was well protected up to the 20th or 22d; at the close the ground was very dry without much frost in it and fall wheat was doing well.

Kansas.—The state is experiencing a protracted drought, seriously inconveniencing stock men and doing wheat no good, but much spring plowing is being done during this warm, dry weather.

Louisiana.—A mild and pleasant winter month; farm work has progressed favorably; cattle on the prairies in excellent condition and the loss trifling.

Minnesota.—The general precipitation was slightly in excess of the normal and as it was nearly all snowfall the ground has been well protected; the

amount of snow lying on the ground at the end of the month averaged 9.8 for the whole state and was 3 inches more than the normal for that date.

Mississippi.—The average rainfall has been 4.2 for the whole state against a normal of 5.1.

Missouri.—The precipitation for the month throughout the state was very light; at the close of the month no snow remained on the ground except at a few places in the northwest section. It has been a good month for business but not so favorable for wheat and grass, owing to a scarcity of water for some months past; many wells and springs are failing. Wheat and fruit are in good condition, but backward and would do better with more snow or rain. The frost was entirely out of the ground at the end of the month. The great fluctuations of temperature seem to have produced much sickness from "la grippe." In the southern and central portions plowing has progressed finely, but there is a great lack of water for the stock.

Nebraska.—There has been a decided deficiency of precipitation, the rain and snow having evaporated or melted without wetting the ground to any depth and the ground is too dry to freeze hard; the greater portion of the grain that has been sown this fall has not sprouted yet.

New England.—The average precipitation for the whole state is 2.9, and that of 23 stations having long records is 4.7 as compared with the normal of 3.6 for these stations. The maximum snowfall for the month has been 49 inches in northern Maine; considerable damage was done to fruit trees in eastern Massachusetts by the ice and sleet storm of December 3.

New Jersey.—The weather has generally been favorable for outdoor work, notably plowing and pruning; winter rye is in good condition.

New Mexico.—Precipitation was below the normal and was heaviest in the northern half of the territory.

Ohio.—Precipitation was in excess mostly in the form of snow; in the northern and middle sections winter wheat is fairly protected; in the southern section it is in a fair condition the freezing and thawing apparently not having had a very bad effect.

Oklahoma.—Precipitation below the normal, the weather remarkably warm and delightful; general increase in the acreage of wheat and other crops.

South Carolina.—The rainy periods were: 1st to 5th; 16th; 29th to 31st; giving an excess on the coast, but deficiency in the interior; the month was favorable for farm work and the fall crops were doing well.

Tennessee.—Precipitation slightly below the normal; fall crops healthy and growing well.

Texas.—On December 16 Capt. Joseph F. Nash reports that in many localities in western Texas no rain has fallen for five months, and consequently there is no grass, the range in many sections having been completely eaten up. Range cattle have been reduced to starvation.

Wisconsin.—Temperature below the average and precipitation considerably above the normal; the ground was covered with snow up to the 20th, but at the end of the month was bare in the southern counties; during the severe cold weather, however, the ground was amply protected and winter grains are probably in good condition as there was little or no frost in the ground; no scarcity of feed, and stock is doing well.

WIND.

The prevailing winds in December, 1893, viz., those that were recorded most frequently at Weather Bureau stations, are shown on Chart II by arrows flying with the wind. The summary of State Weather Service reports also shows the prevailing winds as recorded at voluntary stations; according to these reports northwest winds prevailed in Illinois, Iowa, Nebraska, Wyoming, Wisconsin, Minnesota, North and South Dakota, New England, New Jersey, Georgia, and Florida; southwesterly winds in the Pacific coast states, Rocky Mountain regions, the Southwest, and in Missouri, Kentucky, Indiana, Ohio, Michigan, New York, Maryland, Virginia, North and South Carolina.

HIGH WINDS.

Wind velocities of 50 miles, or more, per hour were reported at regular stations of the Weather Bureau as follows:

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles.				Miles.	
Abilene, Tex.	2	50	nw.	Cheyenne, Wyo.	27	50	w.
Amarillo, Tex.	24	64	sw.	Chicago, Ill.	15	53	sw.
Do	2	56	n.	Do	16	51	nw.
Bismarck, N. Dak.	4	56	nw.	Colorado Springs, Colo.	2	52	nw.
Block Island, R. I.	5	52	ne.	Davenport, Iowa	18	52	sw.
Buffalo, N. Y.	10	58	w.	Dodge City, Kans.	24	52	sw.
Do	16	58	w.	Fort Canby, Wash.	30	54	s.

Wind velocities of 50 miles, or more—Continued.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles.				Miles.	
Fort Canby, Wash.	10	54	s.w.	Pikes Peak, Colo.	11	86	w.
Do	12	58	s.	Do	13	87	w.
Do	15	56	s.	Do	14	80	w.
Do	20	84	s.	Do	23	86	w.
Do	21	56	s.	Shreveport, La.	15	52	w.
Do	31	54	s.	Tatooosh Island, Wash.	15	51	s.
Galveston, Tex.	16	50	n.	Do	21	50	sw.
Hatteras, N. C.	5	56	n.w.	Woods Holl, Mass.	4	54	sw.
Kittyhawk, N. C.	5	60	n.	Do	5	57	ne.
Lexington, Ky.	15	50	sw.	Do	6	51	ne.
Nantucket, Mass.	5	52	ne.	Do	11	53	w.
Pikes Peak, Colo.	1	106	sw.	Do	16	50	s.
Do	10	88	w.	Do	21	55	w.

LOCAL STORMS.

2d.—During a thunderstorm, with high wind, at Water Valley, Miss., small houses and trees were blown down. A heavy snowstorm began at Chicago, Ill., at 7.10 a. m., 2d, and continued until 10.30 a. m., 3d, during which time 8 inches of snow fell, being the heaviest 24-hour snowfall on record in December at that station. Railway and street car traffic was delayed, and some damage was done to buildings at the Columbian Exposition Grounds. During a blinding snowstorm and heavy gale on Lake Michigan, 7 miles from Mich-

igan City, Ind., a tug was sunk in going to the assistance of a freight steamer, and the steamer was badly damaged. The storm was very severe throughout Illinois and Indiana and all traffic was interrupted. During a windstorm at Abilene, Tex., the wind reached a maximum velocity of 50 miles per hour from the northwest; damage was done to outbuildings.

3d.—Severe snowstorms prevailed over New Hampshire, Massachusetts, and New York. In the Pemigewasset and Suncook valleys, N. H., the storm was unusually severe and trains were delayed. At Haverhill, Mass., the snow was attended by rain and sleet, causing heavy damage. At New Bedford, Mass., a southerly storm raged all day, accompanied by heavy rain in the afternoon; considerable damage was done by flood. At Niagara Falls, N. Y., all trains were delayed by the heavy snow.

5th.—A severe storm of rain, snow, and heavy wind prevailed throughout the middle Atlantic and New England states. A number of vessels went ashore on the New England coast. At Nantasket Beach, Salem, Lynn, and Gloucester, Mass., the storm was exceptionally severe. At Block Island, R. I., the gale reached a maximum velocity of 52 miles per hour. Three miles from Block Island a schooner ran ashore; crew were saved by the Life Saving Service; vessel and part of cargo a total loss. Two vessels were wrecked on the north shore of Long Island, N. Y. At Norfolk, Va., rain continued until 2.30 p. m., changing to sleet and snow, and attended by high winds reaching a maximum velocity of 41 miles from the west. Several wrecks were reported north of Cape Charles, Va. Heavy sleet storms at Falkland and Greenville, N. C., caused great destruction to timber. At Society Hill, S. C., a sleet and snow storm did considerable damage to shrubbery and trees.

10th.—Heavy rains in northwest Washington melted the

snow in the mountains, causing all streams to overflow, and doing great damage to bridges, houses, etc.

15th.—A report from Vineyard Haven, Mass., states that 2 barges and a tug went ashore on Naushon Island during a snowstorm. A heavy windstorm of short duration, attended by heavy thunder, passed over Coushatta, La.; 2 buildings were blown down. A severe local storm visited southwest Arkansas in the afternoon. In the vicinity of Magnolia the clouds had a whirling motion and a funnel-shaped cloud was observed; the storm moved northeast and was preceded by heavy rain mixed with hail. A child was killed, and great loss of property was sustained. A heavy storm passed over southern Illinois in the evening; it was a straight blow and possessed remarkable energy. At Harrisburg great damage was done. At Vincennes and Muncie, Ind., many buildings were damaged.

16th.—During a wind and thunder storm at Marshallville, Ga., great damage was done to roofs. At Morgan, Ga., minor damage was done. A heavy gale occurred at Chattanooga, Tenn., in the early morning, damaging glass.

17th.—A thunderstorm occurred at Pasadena, Cal., at 4.30 a. m.; damage by lightning, \$1,000.

23d.—A report from Jacksonville, Fla., states that during a thunderstorm at Estero Island, on the southwest coast, a man was killed by lightning and another seriously injured.

26th.—A heavy windstorm prevailed in northern Virginia. Five miles north of Stanardsville a barn was destroyed and outbuildings were blown down. At Dale Enterprise, Va., outbuildings and fences were damaged.

27th.—A thunderstorm occurred at Los Angeles, Cal., at 7 a. m.; the lightning was vivid and the thunder very heavy. A barn was set on fire and minor damage was done by rain.

31st.—During a heavy thunderstorm at Archer, Fla., at 2 a. m., many trees were struck by lightning.

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS.

The following table shows the danger-points at the various river stations; the highest and lowest stages for the month, with the dates of occurrence; and the monthly ranges for December, 1893:

Heights of rivers above low-water mark, December, 1893.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Height.	Date.	Height.	Date.	
Red River, Shreveport, La.	Feet. 29.0	Feet. 3.4		Feet. 0.7		Feet. 4.1
Arkansas River, Fort Smith, Ark.	22.0	5.2	1	1.0	31	4.2
Little Rock, Ark.	23.0	6.5	2	4.1	31	4.4
Missouri River, Pierre, S. Dak.	13.0					
Sioux City, Iowa*	15.7					
Kansas City, Mo.	21.0	5.7	29	3.1	19	3.6
Mississippi River, Saint Paul, Minn.	14.0					
La Crosse, Wis.	10.0					
Dubuque, Iowa	16.0					
Davenport, Iowa	15.0					
Keokuk, Iowa	14.0					
Hannibal, Mo.	17.0	2.0	23, 24	-1.9	4	3.9
Saint Louis, Mo.	30.0	2.5	28	0.0	9	2.5
Cairo, Ill.	40.0	13.4	28, 29	5.3	1	8.1
Memphis, Tenn.	33.0	6.2	31	2.8	4	5.4
Vicksburg, Miss.	41.0	7.8	20, 21	0.8	2, 3	7.0
New Orleans, La.	13.0	3.9	25, 26	2.0	7	1.9
Ohio River, Parkersburg, W. Va.	38.0	20.0	19	6.9	1	13.1
Cincinnati, Ohio	45.0	24.3	22	9.1	1	15.2
Louisville, Ky.	24.0	10.0	23	5.5	1	5.1
Cumberland River, Nashville, Tenn.	40.0	12.3	4	2.5	2	9.8
Tennessee River, Chattanooga, Tenn.	33.0	4.7	6.7	3.5	1, 29	2.2
Knoxville, Tenn.	29.0	2.9	1, 5.6	1.4	27, 31	1.5
Monongahela River, Pittsburgh, Pa.	22.0	14.3	18	3.7	14	10.6

Heights of rivers—Continued.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Height.	Date.	Height.	Date.	
Savannah River, Augusta, Ga.	Feet. 32.6	Feet. 8.6		Feet. 6.3		Feet. 2.3
Willamette River, Portland, Oregon	15.0	18.7		5.0		13.7
Susquehanna River, Harrisburg, Pa.	17.0	9.8		2.0		6.8
Alabama River, Montgomery, Ala.	48.0	5.7		0.7		5.0
James River, Lynchburg, Va.	18.0	2.6		0.7		1.9
Sacramento River, Red Bluff, Cal.	22.0	7.5		1.8		5.7
Sacramento, Cal.	25.0	17.3		11.5		5.8
Des Moines River, Des Moines, Iowa*	19.0					
Des Moines, Iowa*	4					

* Frozen.

FLOODS.

The above table shows that during the month of December the only river that experienced especial high water was the Willamette, at Portland, Oregon. Other reports show floods on the 4th and 5th at Oregon City, Oregon, preventing trains from passing, and in Elk Creek, washing away flour and saw mills, also in the Coquille River, damaging the railway tracks.

CLOSING OF NAVIGATION.

The weekly "bulletin of snow lying on the ground" gives reports of ice in rivers and harbors, and shows that it was sufficiently thick to impede navigation on Monday, December 4, at Davenport and Dubuque, Iowa, Green Bay, Wis., Keokuk, Iowa, La Crosse, Wis., Omaha, Nebr., Pierre,

S. Dak., Saint Paul, Minn., Sandusky, Ohio, Sioux City, Iowa, Toledo, Ohio, and Williston, N. Dak. On December 11 the following additional places reported ice of 2 inches or more in thickness: Bismarck, N. Dak., Detroit, Mich., Erie, Pa., Kearney, Nebr., Port Huron, Mich., and Rochester, N. Y. On December 18 the following additional places were reported: Albany, N. Y., Alpena, Mich., Chicago, Ill., Harrisburg, Pa., Sault Ste. Marie, Mich., and Yankton, S. Dak. On December 25, at 8 p. m., there was practically no ice in the lower lake region, and thence southward; no change in the thickness of ice was reported from Albany, N. Y., Green Bay, Wis., Dubuque and Sioux City, Iowa; the thickness was 22 inches at Williston, N. Dak. By January 1 the ice in the upper Missouri was 4 to 5 inches thicker; from Detroit, Mich., to Mackinaw, Mich., on Lake Huron, ice was 3 to 7 inches thicker than on December 25. The Mississippi at and below Davenport, Iowa, and the Hudson at and below Albany, N. Y., were then free from ice. A half-inch of ice was reported in the Susquehanna at Harrisburg, Pa.

The following special reports have also been collected:

Buffalo Creek.—Buffalo, N. Y., 16th, one of the most disastrous floods which the Buffalo Creek territory has ever suffered came with the thaw and rain of yesterday. The creek rose 20 feet last night, overflowed its banks, and left 4 feet of water over the whole territory known as South Buffalo.

Connecticut River.—Hartford, Conn., 12th, closed for navigation. New Haven, Conn., 14th, navigation closed.

Detroit River.—Detroit, Mich., 2d to 12th, floating ice; 15th, navigation closed; 20th, frozen, but ice soon broken by ferry boats

Hudson River.—Albany, N. Y., 4th, floating ice; 5th, last boat of the season left at 5 p. m.; 6th, frozen in the morning; 9th, gorged near Kinderhook Light, traffic blocked; 10th, ice gorge remained firm between the upper and lower Kinderhook Lights; 16th, navigation closed from Albany to Poughkeepsie; 25th, ice reported as moving south of Kinderhook; 26th, ice moved during the night, and reported as gorging to the south of Greenbush Bridge; 29th, free from ice. Kingston, N. Y., 13th, temperature at zero all day; frozen solid north of city and people walking across from Heath to Barrytown; earliest closing north of here in many years; south of city navigation going on, but there is considerable floating ice.

Illinois River.—Havana, Ill., 1st, closed for navigation, but opened after 15th.

Kennebec River.—Gardiner, Me., 2d, closed. Bath, Me., 14th, frozen the entire length of the city.

Mississippi River.—Saint Paul, Minn., 12th, generally frozen, except a very narrow strip along the bank in front of city. River-gauge readings suspended. Dubuque, Iowa, 1st, closed by ice. Fort Madison, Iowa, 28th, ice passed out of river. Keokuk, Iowa, 3d, ice gorge formed south of station; 4th, river frozen; 18th, gorge broken by northwest gale; 31st, light running ice. Davenport, Iowa, 2d, river frozen; 25th, ice in river broke up above city and began moving about again but soon became blocked in the afternoon; 28th, ice went out of river at the bridge during the early morning; river

full of floating ice. Warsaw, Ill., 1st, river full of floating ice; 3d, river frozen. Saint Louis, Mo., 3d to 6th, floating ice.

Missouri River.—Greenwood, S. Dak., 2d, frozen and teams crossing on ice. Santee Agency, Nebr., 2d, frozen; 16th, crossed by teams. Sioux City, Iowa, 1st, frozen and navigation closed. Bluffton, Mo., 1st, floating ice. Boonville, Mo., floating ice; 4th, gorged above; 15th, gorge broken; 16th, heavy ice. Hermann, Mo., 1st, navigation closed.

Ohio River.—Wheeling, W. Va., 6th to 9th, 14th, 22d to 24th, floating ice.

Penobscot River.—Orono, Me., 4th, closed by ice.

Saint Croix River.—Calais, Me., 13-14th, frozen solid from the bridge to the narrows.

Saint Lawrence River.—A dispatch to the "Utica Herald" from Clayton, dated 14th, says that the weather is the coldest experienced in that locality in years, 18° below zero. The river is practically frozen over. As far as the eye could see no open water appears, and the dense fog steaming from the water that had almost hidden it for the past few days had all disappeared. It is the first time within the recollection of the oldest residents that the river has frozen over so early in the winter, and with so little snow—not enough for sleighing.

Saint Marys River.—Sault Ste. Marie, Mich., 4th, last boat bound down Lake left to-day; 6th, navigation closed; 19th, frozen.

Susquehanna River.—Lock Haven, Pa., 2d, west branch frozen; 17th, slush ice.

Wabash River.—Lafayette, Ind., 18th, full of floating ice.

Erie Canal.—Rochester, N. Y., closed for navigation.

Susquehanna Canal.—Selins Grove, Pa., 5th, navigation closed.

Lake Superior.—Duluth, Minn., 8th, the last steamer of the season arrived to-day.

Lake Michigan.—Green Bay, Wis., 1st, the schooner "Bacon" arrived, and was the last boat of the season to arrive; 3d, two steamers left port to-day and navigation closed; 4th, ice in the river 8 inches thick. Chicago, Ill., 10th, navigation closed.

Lake Huron.—Port Huron, Mich., 1st to 4th, floating ice in Black River; 13th, two steamers passed up the Lake to-day, being the last departure, and navigation closed; 26th, the warm weather and rain during the past few days has broken up the ice in the Black River; an ice gorge formed in the river and a large number of vessels were torn from their moorings; slight damage to bridge; 30th, 31st, floating ice in Saint Clair River.

Lake Erie.—Erie, Pa., 4th, Presque Isle Bay frozen. Toledo, Ohio, 2d, river and bay frozen, tugs broke a channel through the ice; 7th, the last vessel of the season arrived to-day, navigation closed; 23d, river free from ice. Cleveland, Ohio, 5th to 9th, 11th to 14th, 16th, 20th, 21st, and 22d, floating ice in river; 11th, the last boats of the season left port to-day; 14th, the last boat of the season arrived to-day. Windsor, Ont., 7th, the ice at the head of Lake Erie has become so heavy as to form a very serious obstruction to the passage of boats, only the most powerful steamers being able to force their way through; the ice extends from the mouth of the river to Colchester Point, and a recurrence of freezing weather would close navigation to all Lake Erie ports. Sandusky, Ohio, 4th, navigation closed. Buffalo, N. Y., 16th, navigation closed.

Lake Ontario.—Toronto, Canada, 22d, the bay was frozen over last Saturday, but the subsequent high wind drove the ice all out again on Sunday; last night it was frozen over to the island once more; this is a few days earlier than the freezing of the bay took place last year. Oswego, N. Y., 11th, navigation closed on Lake Ontario.

ATMOSPHERIC ELECTRICITY.

THUNDERSTORMS AND AURORAS.

The table on p. 360 shows in detail for December, 1893, the number of stations from which meteorological reports were received; and the number of such stations reporting thunderstorms (T) and auroras (A), respectively, in each state and on each day of the month on which the phenomena were observed.

THUNDERSTORMS.

A mention of the more severe thunderstorms reported for the month is given under "Local storms."

The dates on which reports were most numerous are the 3d, 15th, 16th, 24th, and 29th.

The dates on which reports were least numerous are the 5th, 8th, 9th, 11th, 13th, 17th, 18th, and 19th.

The states from which the most numerous thunderstorm reports were received were Florida, Iowa, Louisiana, and South Carolina.

AURORAS.

The evenings on which the full moonlight must have interfered with observations were the 12th to 20th. On the

remaining 23 evenings 73 aurora reports were received, or an average of 3 per day. The dates on which the reported number especially exceeded this average were the 5th, 27th, and 29th. The only date on which both thunderstorms and aurora reports were specially numerous was the 29th. None of the auroras of December seem to have been especially brilliant.

In reference to the aurora of November 1, 1893 (see MONTHLY WEATHER REVIEW, p. 328), the observer at Marquette, Mich., reports that the display extended from the northern horizon up to an altitude of 110°, viz., to a point 20° south of the zenith. The greatest extent of the display around the horizon was from azimuth 50° around to the north to azimuth 310; the streamers extending from all this part of the horizon up toward the point 20° south of the zenith.

The observer at Havre, Mont., reports that at 9.15, p. m., the crown of the arch in the north was 40° in altitude, and the extremities of the arch were 180° apart in azimuth; at 1, a. m., November 2, the east end of the arch was 10° south of the east point of the compass, with an altitude of 90° at crown of arch.

Thunderstorms and auroras, December, 1893.

States.	No. of stations.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	Total.
Alabama	48	T.															2											4	3		12 T.		
Arizona	54	T.																										o A.	1 T.				
Arkansas	38	T.																3										1 A.	3 T.				
California	303	A.																	I										o A.	9 T.			
Colorado	77	T.	I	I																I	2	2								2 T.	2 A.		
Connecticut	24	T.																											1 T.	2 A.			
Delaware	5	T.																											3		3 A.		
District of Columbia	4	T.																											o T.	1 A.			
Florida	34	T.																	I	10									2	3	6		
Georgia	52	T.																		5										3	1	23 T.	
Idaho	17	T.																											o A.	o A.			
Illinois	55	T.																	3										2		5 T.		
Indiana	40	T.	I	I															2											o A.	4 T.		
Indian Territory	6	T.																											o A.	o T.			
Iowa	77	T.																	3										1	30	33 T.		
Kansas	72	T.																											3	1 A.	3 A.		
Kentucky	33	T.																	I										o A.	4 T.			
Louisiana	46	T.																	I	4	2								1	2	5		
Maine	20	T.																											o T.	2 A.			
Maryland	24	T.																											o T.	1 A.			
Massachusetts	85	T.	I															2	I										1	5	4 T.		
Michigan	70	T.																	I										8 A.	8 T.			
Minnesota	73	T.																	I										3	1 A.	3 A.		
Mississippi	38	T.		I	2	1													I	2									1	8	13 A.		
Missouri	95	T.																		9									1	5	14 T.		
Montana	21	T.																		I	5								1	2	16 T.		
Nebraska	72	T.																		I	5								1	1 A.	6 T.		
Nevada	48	T.																		I										1		1 A.	
New Hampshire	25	T.																	I											3		o A.	
New Jersey	54	T.																	I											3		4 A.	
New Mexico	20	T.																		I										3		4 A.	
New York	75	T.																												8	12 T.		
North Carolina	55	T.																	8	I										4	1 A.		
North Dakota	5	T.																												o T.	2 A.		
Ohio	131	T.																												2	3 T.		
Oklahoma	10	T.																												1	2 A.		
Oregon	66	T.	I	I																										o T.	o A.		
Pennsylvania	82	T.																2											3	1 A.	4 T.		
Rhode Island	9	T.																	I										3	1 A.	3 A.		
South Carolina	43	T.																17	I										2	22 T.			
South Dakota	43	T.																	I										o T.	o A.			
Tennessee	38	T.																	I	2									2	4 A.			
Texas	74	T.																	I	3									1	6 T.			
Utah	29	T.	I																	I										1	o A.		
Vermont	14	T.																		I										2	1 T.		
Virginia	39	T.		I	I															I										3	2 T.		
Washington	42	T.																	I											1	o A.		
West Virginia	13	T.																		I										1	o T.		
Wisconsin	58	T.																	2	I										3	6 T.		
Wyoming	13	T.																	I											1	o A.		
Sums	2,479	T.	5	8	39	4	0	2	0	1	1	0	4	0	1	32	24	0	0	0	3	4	4	53	15	2	1	5	8	6	253	T.	
		A.	2	0	0	2	13	1	0	1	0	1	0	0	2	1	0	0	0	1	0	0	0	0	2	10	3	31	77	A.			

STATE WEATHER SERVICES.

[Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.]

The following extracts and summaries are republished from reports for December, 1893, of the directors of the various state weather services:

ALABAMA.

Temperature.—The mean was 3.4 above the normal; maximum, 86, at Geneva, 26th; minimum, 14, at Chepultepec, 5th.

Precipitation.—Greatest monthly, 5.30, at Greensboro; least monthly, 1.12, at Sturdevant.

Wind.—Prevailing direction, north.—*F. P. Chaffee, Local Forecast Official, Weather Bureau, Montgomery, director.*

ARIZONA.

Temperature.—The mean was 4.0 above the normal; maximum, 85, at Buckeye, 17th; minimum, —3, at Flagstaff, 31st; greatest monthly range, 68, at Whipple Barracks; least monthly range, 35, at Red Rock.

Precipitation.—The average was 1.20 below the normal; greatest monthly, 1.80, at Flagstaff; least monthly, 0.00, at Red Rock.

Wind.—Prevailing directions, west and southwest.—*W. Burrows, Observer, Weather Bureau, Tucson, director.*

ARKANSAS.

Temperature.—The mean was 0.2 below the normal; maximum, 79, at Bee Branch, 25th; minimum, 3, at Rogers, 4th; greatest monthly range, 65, at Bee Branch and Rogers; least monthly range, 46, at Mount Nebo.

Precipitation.—The average was 2.51 below the normal; greatest monthly, 3.27, at Stuttgart; least monthly, 0.65, at Texarkana.

Wind.—Prevailing direction, south.—*F. H. Clarke, Local Forecast Official, Weather Bureau, Little Rock, director; G. G. Harkness, Observer, Weather Bureau, assistant.*

CALIFORNIA.

Temperature.—The mean was 3.1 below the normal; maximum, 94, at Downey, 2d; minimum, zero, at Boca and Truckee, 30th; greatest monthly range, 61, at Tehachapi; least monthly range, 20, at Sutter Creek.

Precipitation.—The average was 2.82 above the normal; greatest monthly, 10.81, at Crescent City L. H.; least monthly, trace, at Indio and Salton.

Wind.—Prevailing direction, south.—*J. A. Barwick, Observer, Weather Bureau, Sacramento, director.*

COLORADO.

Temperature.—The mean was 1.0 above the normal; maximum, 73, at Akron, 17th, and at Minneapolis, 14th; minimum, —18, at Gunnison, 28th, and at Pikes Peak, 30th.

Precipitation.—The average was 0.10 above the normal; greatest monthly, 8.51, at Breckenridge; least monthly, 0.00, at Garnet.

Wind.—Prevailing direction, west.—*J. J. Gilligan, Observer, Weather Bureau, Denver, director.*

FLORIDA.

Temperature.—The mean was 1.5 above the normal; maximum, 85, at Kissimmee, 12th; minimum, 26, at Pensacola, 5th; greatest monthly range, 55, at Plant City; least monthly range, 26, at Key West.

Precipitation.—The average was 0.07 above the normal; greatest monthly, 6.96, at Lake City; least monthly, 1.18, at Key West.

Wind.—Prevailing direction, northeast.—*E. R. Demain, Observer, Weather Bureau, Jacksonville, director.*

GEORGIA.

Temperature.—Maximum, 80, at Darien, 25th; minimum, 16, at Camilla, 18th; greatest monthly range, 55, at Elberton and Millen; least monthly range, 35, at Darien.

Precipitation.—Greatest monthly, 7.08, at Poulan; least monthly, 0.75, at Columbus.

Wind.—Prevailing direction, northwest.—*Park Morrill, Local Forecast Official, Weather Bureau, Atlanta, director.*

IDAHO.

Temperature.—Maximum, 60, at Payette, 10th; minimum, —13, at Fort Lemhi, 27th; greatest monthly range, 59, at Fort Lemhi; least monthly range, 33, at Grangeville.

Precipitation.—Greatest monthly, 5.69, at Murray; least monthly, 0.25, at Oakley.

Wind.—Prevailing direction, south.—*J. H. Smith, Observer, Weather Bureau, Idaho Falls, director.*

ILLINOIS.

Temperature.—The mean was 1.1 above the normal; maximum, 74, at Muddy Valley, 25th; minimum, —14, at Oswego, 4th, and at Winnebago, 13th.

Precipitation.—The average was 0.89 below the normal; greatest monthly, 2.60, at Aurora; least monthly, 0.25, at Warsaw.

Wind.—Prevailing direction, northwest.—*John Craig, Observer, Weather Bureau, Springfield, director.*

INDIANA.

Temperature.—The mean was 0.3 above the normal; maximum, 75, at Bedford, 26th; minimum, —11, at Lafayette, 4th; greatest monthly range, 74, at Lafayette; least monthly range, 49, at Laconia.

Precipitation.—The average was 0.44 below the normal; greatest monthly, 4.35, at Muncie; least monthly, 1.34, at Logansport.

Wind.—Prevailing direction, southwest.—*Prof. H. A. Huston, Lafayette,*

director; C. F. R. Wappenhans, Local Forecast Official, Weather Bureau, assistant.

IOWA WEATHER AND CROP SERVICE.

Temperature.—The mean was 1.5 below the normal; maximum, 70, at Centerville, 2d; minimum, —21, at Sibley, 1st; greatest monthly range, 77, at Centerville; least monthly range, 56, at Storm Lake.

Precipitation.—The average was 0.34 below the normal; greatest monthly, 2.80, at Centerville; least monthly, 0.46, at Villisca.—*J. R. Sage, Des Moines, director; G. M. Chappel, Local Forecast Official, Weather Bureau, assistant.*

KANSAS.

Temperature.—The mean was 2.8 above the normal; maximum, 75, at Englewood, 15th, and at Kiowa, 22d; minimum, —1, at Colby, 1st; greatest monthly range, 71, at Hays City; least monthly range, 58, at Sterling.

Precipitation.—The average was 0.49 below the normal; greatest monthly, 1.33, at Horton; least monthly, trace, at Emporia and Garden City.

Wind.—Prevailing direction, south.—*T. B. Jennings, Observer, Weather Bureau, Topeka, director.*

KENTUCKY.

Temperature.—The mean was 0.7 above the normal; maximum, 78, at Paducah, 25th; minimum, 10, at Ebanks, 18th; greatest monthly range, 65, at Paducah and Princeton; least monthly range, 37, at South Fork.

Precipitation.—The average was 1.28 below the normal; greatest monthly, 3.47, at Greensburg; least monthly, 1.04, at Alpha.

Wind.—Prevailing direction, southwest.—*Frank Burke, Local Forecast Official, Weather Bureau, Louisville, director.*

LOUISIANA.

Temperature.—The mean was 0.6 above the normal; maximum, 88, at Abbeville, 1st; minimum, 20, at Oxford, 4th; greatest monthly range, 62, at Oxford; least monthly range, 38, at Port Eads.

Precipitation.—The average was 1.68 below the normal; greatest monthly, 6.84, at Opelousas; least monthly, 0.06, at Houma.

Wind.—Prevailing direction, north.—*R. E. Kerkam, Local Forecast Official, Weather Bureau, New Orleans, director.*

MARYLAND.

Temperature.—The mean was 1.1 above the normal; maximum, 68, at Charlotte Hall, 1st, at Upper Marlboro, 24th, and at Millsboro, Del., 3d; minimum, 5, at Charlotte Hall, 14th; greatest monthly range, 63, at Charlotte Hall; least monthly range, 41, at New Market.

Precipitation.—The average was 0.63 below the normal; greatest monthly, 4.05, at Cambridge; least monthly, 0.55, at New Market.

Wind.—Prevailing direction, southwest.—*Dr. William B. Clark, Johns Hopkins University, Baltimore, director; Prof. Milton Whitney, Maryland Agricultural College, secretary and treasurer; C. P. Cronk, Observer, Weather Bureau, in charge.*

MICHIGAN.

Temperature.—The mean was 4.8 below the normal; maximum, 64, at Climax and Mottville, 24th; minimum, —14, at Lathrop, 4th, and at Sault Ste. Marie, 30th; greatest monthly range, 71, at Adrian and Flint; least monthly range, 36, at Lake City.

Precipitation.—The average was 1.13 above the normal; greatest monthly, 6.95, at Grand Rapids; least monthly, 2.07, at Fairview.

Wind.—Prevailing direction, southwest.—*E. A. Evans, Local Forecast Official, Weather Bureau, Detroit, director.*

MINNESOTA.

Temperature.—The mean was 4.6 below the normal; maximum, 55, at Bingham Lake, 21st; minimum, —40, at Pokegama Falls, 13th and 30th, and at Pine River Dam, 13th; greatest monthly range, 80, at Red Lake; least monthly range, 53, at Crookston.

Precipitation.—The average was 0.52 above the normal; greatest monthly, 4.08, at Wabasha; least monthly, 0.30, at Saint Vincent.

Wind.—Prevailing direction, northwest.—*E. A. Beals, Observer, Weather Bureau, Minneapolis, director.*

MISSISSIPPI.

Temperature.—The mean was 3.0 above the normal; maximum, 79, at Port Gibson, 12th; minimum, 18, at Louisville, 6th; greatest monthly range, 58, at Vaiden; least monthly range, 42, at Biloxi.

Precipitation.—The average was 0.93 below the normal; greatest monthly, 7.21, at Meridian; least monthly, 1.54, at Biloxi.

Wind.—Prevailing directions, north and south.—*R. J. Hyatt, Local Forecast Official, Weather Bureau, Vicksburg, director.*

MISSOURI.

Temperature.—The mean was 1.5 above the normal; maximum, 76, at Grovedale, 23d; minimum, —7, at Unionville, 11th; greatest monthly range, 81, at Grovedale; least monthly range, 48, at Gayoso.

Precipitation.—The average was 1.22 below the normal; greatest monthly, 3.85, at Brunswick; least monthly, 0.10, at Lamonte and New Palestine.

Wind.—Prevailing direction, southwest.—*J. R. Rippey, Secretary, State*

Board of Agriculture, Columbia, director; E. H. Nimmo, Observer, Weather Bureau, assistant.

MONTANA.

Temperature.—The mean was 5.5 above the normal; maximum, 59, at Mingusville, 4th; minimum, —33, at Mingusville, 12th; greatest monthly range, 92, at Mingusville; least monthly range, 38, at Cokedale.

Precipitation.—The average was 0.17 below the normal; greatest monthly, 4.09, at Cokedale; least monthly, trace, at Mingusville.

Wind.—Prevailing direction, southwest.—*J. M. Sherier, Observer, Weather Bureau, Helena, director.*

NEBRASKA.

Temperature.—The mean was 1.5 above the normal; maximum, 71, at Lexington, 28d; minimum, —16, at Valentine, 1st; greatest monthly range, 76, at Valentine; least monthly range, 32, at Haigler.

Precipitation.—The average was 0.15 above the normal; greatest monthly, 2.35, at Hartington; least monthly, trace, at Haigler.

Wind.—Prevailing direction, northwest.—*George E. Hunt, Local Forecast Official, Weather Bureau, Omaha, director.*

NEVADA.

Temperature.—The mean was 1.4 above the normal; maximum, 72, at Belleville, 3d; minimum, —15, at Empire Ranch, 26th; greatest monthly range, 80, at Sunnyside; least monthly range, 40, at Virginia City.

Precipitation.—The average was 1.19 below the normal; greatest monthly, 2.33, at Stofiel; least monthly, 0.00, at Hot Springs.

Wind.—Prevailing direction, southwest.—*Prof. Charles W. Friend, Carson City, director; F. A. Carpenter, Observer, Weather Bureau, assistant.*

NEW ENGLAND.

Temperature.—The mean was 2.3 below the normal; maximum, 62, at Providence (b), 4th; minimum, —36, at Fairfield, 14th; greatest monthly range, 85, at Woodstock; least monthly range, 46, at Newport.

Precipitation.—The average was 1.18 above the normal; greatest monthly, 7.73, at Calais; least monthly, 2.30, at Stevenson.

Wind.—Prevailing direction, northwest.—*J. Warren Smith, Weather Bureau, Boston, director.*

NEW JERSEY.

Temperature.—The mean was 2.4 above the normal; maximum, 70, at Lancewood, 25th; minimum, 5, at Chester, Newton, and Woodbine, 14th, at Somerville, 6th and 14th, and at Belvidere, 8th; greatest monthly range, 62, at Toms River and Lancewood; least monthly range, 41, at Ocean City.

Precipitation.—The average was 0.23 below the normal; greatest monthly, 4.66, at Tenafly; least monthly, 1.67, at Blairstown.

Wind.—Prevailing direction, northwest.—*E. W. McGann, Observer, Weather Bureau, New Brunswick, director.*

NEW YORK.

Temperature.—The mean was 1.0 above the normal; maximum, 65, at Plattsburg Barracks, 23d and 24th; minimum, —31, at Saranac Lake, 13th; greatest monthly range, 83, at Plattsburg Barracks; least monthly range, 46, at Fort Niagara.

Precipitation.—The average was 0.98 above the normal; greatest monthly, 6.93, at Utica; least monthly, 1.36, at Fleming.

Wind.—Prevailing direction, southwest.—*Prof. E. A. Fuertes, Dean of the College of Civil Engineering, Cornell University, Ithaca, director; R. M. Hardinge, Observer, Weather Bureau, assistant.*

NORTH CAROLINA.

Temperature.—The mean was 1.4 above the normal; maximum, 76, at Tarboro, 3d; minimum, 10, at Bakersville, 5th; greatest monthly range, 60, at Bakersville and Soapstone Mount; least monthly range, 36, at Hatteras and Salisbury.

Precipitation.—The average was 0.85 above the normal; greatest monthly, 5.88, at Washington; least monthly, 0.79, at Mocksville.

Wind.—Prevailing direction, northwest.—*Dr. Herbert B. Battle, Raleigh, director; C. F. von Herrmann, Observer, Weather Bureau, assistant.*

NORTH DAKOTA.

Temperature.—The mean was 5.5 below the normal; maximum, 55, at Fort Berthold, 4th; minimum, —36, at Portal, 12th, and at Woodbridge, 10th; greatest monthly range, 87, at Fort Berthold; least monthly range, 61, at Jamestown.

Precipitation.—The average was 0.18 above the normal; greatest monthly, 1.92, at Williston; least monthly, 0.04, at Bottineau.

Wind.—Prevailing direction, southwest.—*B. H. Bronson, Observer, Weather Bureau, Bismarck, director.*

OHIO WEATHER AND CROP SERVICE.

Temperature.—The mean was 0.2 above the normal; maximum, 72, at Portsmouth, 24th; minimum, —5, at Wauseon, 2d; greatest monthly range, 71, at Wauseon; least monthly range, 46, at Demos.

Precipitation.—The average was 0.18 above the normal; greatest monthly, 5.35, at Wheeler; least monthly, 0.99, at Ripley.

Wind.—Prevailing direction, southwest.—*L. N. Bonham, Columbus, director; C. M. Strong, Observer, Weather Bureau, assistant.*

OKLAHOMA.

Temperature.—The mean was 4.0 above the normal; maximum, 80, at Mangum, 11th; minimum, 7, at Keokuk Falls, 4th.

Precipitation.—The average was 1.67 below the normal; greatest monthly, 2.77, at Fort Sill; least monthly, 0.50, at Gwendale.

Wind.—Prevailing direction, south.—*J. I. Widmeyer, Observer, Weather Bureau, Oklahoma City, director.*

PENNSYLVANIA.

Temperature.—The mean was 0.7 below the normal; maximum, 70, at Easton, 24th; minimum, —7, at Dyberry, 14th; greatest monthly range, 65, at Drifton; least monthly range, 41, at Chambersburg.

Precipitation.—The average was 0.12 below the normal; greatest monthly, 6.07, at Smethport; least monthly, 1.41, at Bloomsburg.

Wind.—Prevailing direction, west.—*Under direction of the Franklin Institute, Philadelphia; W. P. Tatham, director; T. F. Townsend, Local Forecast Official, Weather Bureau, assistant.*

SOUTH CAROLINA.

Temperature.—Maximum, 79, at Trial, 3d; minimum, 17, at Hollands Store, 21st.

Precipitation.—Greatest monthly, 4.67, at Georgetown; least monthly, 1.31, at Hollands Store.

Wind.—Prevailing direction, northwest.—*J. W. Bauer, Observer, Weather Bureau, Columbia, director.*

SOUTH DAKOTA.

Temperature.—The mean was 4.5 below the normal; maximum, 61, at Rapid City, 21st; minimum, —31, at Webster, 1st; greatest monthly range, 88, at Aberdeen; least monthly range, 50, at Oelrichs.

Precipitation.—The average was 0.39 above the normal; greatest monthly, 2.29, at Sioux Falls; least monthly, 0.10, at Vermillion.

Wind.—Prevailing direction, northwest.—*S. W. Glenn, Local Forecast Official, Weather Bureau, Huron, director.*

TENNESSEE WEATHER AND CROP SERVICE.

Temperature.—The mean was 0.4 below the normal; maximum, 73, at Memphis, 24th, and at Clarksville, 25th; minimum, 18, at Andersonville, 5th; greatest monthly range, 59, at Clarksville; least monthly range, 23, at Florence Station.

Precipitation.—The average was 0.68 below the normal; greatest monthly, 4.43, at Riddleton; least monthly, 2.03, at Rogersville.

Wind.—Prevailing direction, south.—*J. B. Marbury, Local Forecast Official, Weather Bureau, Nashville, director.*

TEXAS.

Temperature.—The mean was 2.7 above the normal; maximum, 89, at Fort Ringgold, 16th; minimum, 4, at Fort Hancock, 30th; greatest monthly range, 72, at Fort Hancock; least monthly range, 28, at Haskell.

Precipitation.—The average was 1.28 below the normal; greatest monthly, 3.02, at Orange; least monthly, 0.00, at Fort McIntosh, Haskell, and Kyle.

Wind.—Prevailing direction, south.—*D. D. Bryan, Galveston, director; I. M. Cline, Local Forecast Official, Weather Bureau, assistant.*

UTAH.

Temperature.—Maximum, 70, at Saint George, 9th; minimum, —19, at Scofield, 31st; greatest monthly range, 75, at Scofield; least monthly range, 39, at Salt Lake City.

Precipitation.—Greatest monthly, 3.95, at Heber; least monthly, 0.30, at Loa.

Wind.—Prevailing direction, southwest.—*G. N. Salisbury, Observer, Weather Bureau, Salt Lake City, director.*

VIRGINIA.

Temperature.—Maximum, 83, at Avon, 24th; minimum, 7, at Fredericksburg, 6th; greatest monthly range, 71, at Avon; least monthly range, 42, at Cape Charles and Hampton.

Precipitation.—Greatest monthly, 4.80, at Birds Nest; least monthly, 0.54, at Dale Enterprise.

Wind.—Prevailing direction, southwest.—*Dr. E. A. Craighill, Lynchburg, director; J. N. Ryker, Observer, Weather Bureau, assistant.*

WEST VIRGINIA.

Temperature.—Maximum, 76, at Burlington, 25th; minimum, 7, at Marlinton, 21st; greatest monthly range, 66, at Burlington; least monthly range, 43, at Wheeling.

Precipitation.—Greatest monthly, 8.73, at Beverly; least monthly, 0.32, at Harpers Ferry.

Wind.—Prevailing direction, west.—*W. W. Dent, Observer, Weather Bureau, Parkersburg, director.*

WISCONSIN.

Temperature.—The mean was 6.0 below the normal; maximum, 58, at Beloit and Sharon, 24th; minimum, —35, at Hayward and Osecola, 13th; greatest monthly range, 82, at Black River Falls; least monthly range, 56, at Weston and Manitowoc.

Precipitation.—The average was 1.00 below the normal; greatest monthly, 5.10, at Eau Claire; least monthly, 0.84, at Delavan.

Wind.—Prevailing direction, northwest.—*W. L. Moore, Local Forecast Official, Weather Bureau, Milwaukee, director.*

WYOMING.

Temperature.—Maximum, 65, at Wheatland, 10th; minimum, —16, at Sheridan, 12th; greatest monthly range, 70, at Sheridan; least monthly range, 38, at Fort Yellowstone.

Precipitation.—Greatest monthly, 1.91, at Fort Yellowstone; least monthly, 0.10, at Laramie.

Wind.—Prevailing direction, northwest.—*E. M. Ravenscroft, Observer, Weather Bureau, Cheyenne, director.*

OBSERVATIONS ON THE GREAT LAKES.

REPORTS FROM VESSELS.

The Lake Marine Section of the Forecast Division has received reports for December from the captains of 2 vessels navigating the Great Lakes during the first few days of the month after which they went into winter quarters. Navigation had generally closed by December 15.

REPORTS FROM U. S. LIFE-SAVING STATIONS.

Through the co-operation of the General Superintendent of the Life-Saving Service and the Secretary of the Treasury, the Weather Bureau has received 106 weekly transcripts of journals for the month of December from the keepers of 36 U. S. Life-Saving stations on the Great Lakes. Many of these stations "went out of commission" for the winter during this month. The following special notes by the respective keepers are extracted from these journals:

Middle Island, Lake Huron.—Donald McKenzie, keeper. December 16, the storm-signal displays and telephone service furnished this station by the Weather Bureau have been of great value to shipmasters and owners during

the short period elapsed since this most important service has been established; they have been highly appreciated and will be more so hereafter. This station is on the track of all commerce between the lower and upper lakes; the vessels pass close to these islands and attention is given to the signals. The telephone has been useful in the cases of six casualties occurring here, besides giving much information as to weather and telegrams. The number of craft of all kinds passing here from April to December 15 was 21,090 steam and sail vessels, besides many that can not be seen owing to thick weather, making an average daily for eight and one-half months of about 82, not including log rafts. Over 300 craft have been sheltered during storms in this vicinity. The coast above and below these islands is too much exposed for about 100 miles each way to allow of any safe harbors, and the important services rendered here by the Weather Bureau are much sought after and of great importance to sailors.

Sturgeon Point, Lake Huron.—J. E. Henderson, keeper. December 9, more ice in sight than I have seen at this date since 1885.

SURFACE CURRENTS AND FOG ON THE LAKES.

Owing to the close of navigation there have been no special reports of fogs. The general report on the currents has been prepared by the Chief of the Weather Bureau and will soon be published.

NOTES BY THE EDITOR.

THE NORTHERS OF TAMPICO AND VERA CRUZ.

The relation of the hurricanes of the West Indies to the northerns of the Mexican coast was partially elucidated by W. C. Redfield in a memoir published in successive numbers of the American Journal of Science for 1844 (second series, Vol. 1). Having found that the norther of October 2, 3, and 4, 1837, at Matamoras, was simply the western side of a West Indian hurricane about to recurve in its path, and having found that the paths of other hurricanes were apparently affected by the high barometric pressure on the northwestern side, causing them to move east-northeast rather than northeast or north-northeast, he framed a hypothesis that all Mexican and Texas northerns were connected with hurricanes. In his memoir he therefore traces with care the tracks of the centers of revolving storms beginning respectively: 1842, October 2, in the Gulf of Campeche; 1844, October 4, in the Gulf of Honduras; 1837, September 26, on the northern coast of Venezuela. He classes all of these as storms that had moved into the Caribbean Sea and Gulf of Mexico from some distant point, and considers the northerns that prevailed in the western portion of the Gulf as due to the western half of these revolving storms. On the other hand, the study of the U. S. Weather Maps showed, even in 1871, that a norther flowing over Texas and the western portion of the Gulf of Mexico was not always preceded by a hurricane to the southward, although it was generally preceded by a barometric depression of several tenths of an inch, and its flow into the Bay of Campeche frequently determined the formation of a whirl that, moving northeastward, might rapidly develop into a hurricane. All the observations given by Redfield in connection with his storms of October 2, 1842, and October 4, 1844, are consistent with their origin in this manner, and the storms of October 1 and October 21, 1893 (see low areas III and XV of that month), apparently belong to that same class. Redfield's hurricane of 1842, August 30 to September 9, pursued a track that kept remarkably close to the parallel of N. 23° , and is believed by him to have passed from the Atlantic to the coast of Durango, Mexico, where the reports from stations show that a violent north wind, followed by a calm and then a furious south wind, advanced westward to about 60 miles from the coast, after which it reached the table-land and was heard from no more. If this storm on the lowlands of Mexico was really the continuation of the hurricane experienced a few days before in the Bahamas, it adds one more to the list of whirlwinds broken up by impinging upon the land, but does not diminish the number of cases in which cool and dry northerly winds blowing from the land upon the warm water of the Gulf of Mexico or the Atlantic ocean have contributed to the formation of a new whirlwind.

A norther prevailed at Vera Cruz from September 29 to October 2, 1842; its maximum force was at midnight September 30. Redfield states that the hurricane of which he considers this to have been the western quadrant must therefore have been moving very slowly at that time; that this protracted duration is not unfrequent, but rather common in the northerns at Vera Cruz; that this may be ascribed with probability to the cessation of the westerly progression of the storm and the gradual commencement of an easterly course. This explanation by Redfield implies that a hurricane had moved west or west-northwest through Honduras, Yucatan, and Mexico and turned to a north-eastward course about October 2 in the Bay of Campeche. A transference of a revolving system of hurricane winds across or over the mountains of Central America is, however, difficult to believe until conclusive proof is offered, and especially in view of the fact that while this is supposed to be going on the volcanic smoke and the upper clouds of these regions continue to flow from west-southwest undisturbed.

The maps of International Simultaneous Observations indicate quite clearly that when a norther prevails in the Gulf of Mexico or the Caribbean Sea

there exists a wide-spread barometric depression on the Pacific coast of Mexico or in the northern portion of South America, respectively, but not necessarily any hurricane, properly so-called. The flow of cold air determines the formation of a hurricane center somewhere within this general depression if all conditions are favorable. In a similar way, a general depression in the Indian Ocean is followed by an inflow of cooler or drier air and the formation of a typhoon center somewhere within the general depression. So, also, the typhoons of the China Sea are sometimes determined by the flow southward of air from the interior of Asia.

The norther that began September 29, 1842, at Vera Cruz and was at its maximum by midnight had moderated materially by October 3, but the wind continued northwest until October 4. On the 29th the Mexican brig "Se-cunda Fama" sailed from Vera Cruz and on October 2 was inside of the bar at Tampico; during the whole of this interval she seems to have had no experience of the norther, but on the latter date was suddenly attacked by it and drove on the reef of Lobos Island, about 45 miles south of Tampico. The schooner Caroline when about 100 miles east of Matamoras on October 1 ran into the gale which was blowing from the northeast then and there, but as she sailed eastward through it the wind became northerly in the central portions and northwest as she passed eastward from the center, so that she was driven near to the Campeche bank.

These and other reports gathered by Redfield are consistent with a rather different explanation of the nature of this and other northerns on the Gulf, and one that I have often advocated. We have here a mass of cool, dry air flowing from Texas nearly due south or south-southeast and steadily reinforced by fresh supplies from the northward. In the central axis of this stream the current preserves a nearly uniform movement forward, but both in front and on either side the air has to push opposing air away, and there is, therefore, a steady outflow so that on the easterly side of the axis northwesterly winds are found, while on the western side northeasterly occur, and these may curve around even to westerly and easterly, respectively. The winds on the western side of the axis are moving in the wrong direction to form a permanent cyclonic whirl, they are pushing toward the Mexican coast and piling up clouds and possibly forming local small whirls before they reach the table-lands, so that an observer on the table-lands, looking northeastward, sees the ocean of clouds below him long before he feels the northeasterly wind, even if it comes at all; it thus happens that Tampico and Matamoras experience these winds several days later than Vera Cruz. On the eastern side of the axis the deflection of the wind conspires with the rotation of the earth to the formation of hurricanes, which subsequently move northeastward over the Gulf of Mexico with rapidly increasing velocity.

Vessels that keep near the Mexican coast avoid the severity of the gale that prevails 50 miles away to the eastward, but they experience short-lived whirls and squalls; for instance, Redfield quotes from the record of H. M. S. "Thunderer," in December, 1840, at Vera Cruz; just before the norther commences the scud can be seen overhead progressing rapidly from southeast to northwest, which shows that the northerly wind is rising and flowing back on itself toward the northwest. The most certain forerunner of the norther was, in those days, well known to be a barometric fall of from 0.2 to 0.4, which is followed in a short time by northerly winds at Vera Cruz. The northerns of the month of May to August in Mexico are a different type of storm; they are known as the "northerns of Muerto Colorado," and begin at northeast and settle at north-northwest. During these months the southwest hurricanes blow on the Pacific coast of Mexico, and, like the "Muertos," are due to the area of low pressure that then prevails from Arizona southward and southwestward. When this area of low pressure disappears in the winter months, the west coast of Mexico experiences the violent local storms known

as "Papagello," "Tapayaguas," or "Tehuantepec," which are violent from the northeast and north-northeast, and represent the flow of dry, cold air from the Mexican plateaus down to the Pacific. These various styles of northerly winds are, of course, to be distinguished from the northerly gales that descend from Texas, and are known as the "northers of Texas and Vera Cruz," and which also extend to Yucatan, Honduras, and occasionally to Panama; but when they extend so far southward as this they imply the presence of a severe hurricane passing from the West Indies northward into the United States.

On the norther of December 1, 1893, Prof. G. Batturoni, of the Meteorological Observatory of the Literary and Mercantile Institute at Vera Cruz, reports to the effect that it blew with extraordinary violence, causing serious damage and some loss of life. "My observatory had forewarned the port of Vera Cruz that a strong norther might be expected between November 29 and December 1, and it actually began with a feeble north wind on the 30th, which continued throughout the day until it backed in the evening to west-southwest. During December 1, the wind was from east-southeast and southeast rather stronger than ordinarily, but not exceeding 6 miles per hour and backing to the south during the night and finally returning on the 2d to east-southeast. On the 2d the wind again backs from east-southeast to west, and then south returning to east-southeast, and, finally, by 1 a. m. of the 3d, to west. On the 2d my observatory hoisted the signal: 'the norther is at hand.' During the nights of these days lightning without thunder continued uninterruptedly. During the daytime the peaks of Orizaba, the 'cofre' of Perote, and all the peaks of the Cordilleras showed all the symptoms that are invariably preliminary to a norther, the volcano of San Andres and the Sierra of San Martin were clearly visible after the 1st, the typical cloud of which I have previously spoken was imperfectly formed on the 1st, but perfectly definite at 4 p. m. of the 2d, but its position on this occasion was to the west-southwest instead, as ordinarily, to the west-northwest.

"During the nights from the 29th to the 2d the sea roared more than it usually does; the noise increased on the 1st and the 2d to a remarkable degree: the sea continued very high, and the sunset of the 2d showed persistent reddish tints of a very pronounced copper-red over the whole horizon, except from the south to the east-southeast.

"On the 2d day broke with the wind from the west, at 8 a. m. it was from the northwest, very feeble, and at 9.33 nearly north, but continued weak. A thick, black cloud, resting on a thick layer, rolled along from the north-northeast rapidly to the west, and an hour later the cloud suddenly spread and the first gust, with a velocity of 10 miles per hour, was felt at the observatory. At midday the velocity had doubled; at 1.30, quadrupled; and afterwards it increased until it reached a velocity of 60 miles; it continued, with a mean velocity of 55 miles, for more than seven hours; the whirling gusts were so violent that they demolished the walls of the houses most exposed to them.

"The wind continued, with terrible gusts, until 10 p. m.; at 11.30 p. m. its force seemed to diminish, but from midnight until 3 a. m., December 4, it returned to its former violence; at 4 a. m. it had a velocity of 40 miles; at 6 a. m., only 30; at 10.24 a. m., and, finally, at 3 p. m., only 15 miles per hour. The schooner 'Jamapa' was dashed on the coast, as well as several other vessels of less importance. Three houses in the suburbs fell to the ground, killing a poor woman and wounding 2 other persons; the works of the port suffered also; in the city the roofs of several houses were blown off; at La Piedra, nearly 10 leagues from here, the same thing occurred; iron plates were carried 30 meters; at Soledad also, 10 leagues distant, the wind tore up trees and marked its passage with disaster everywhere, particularly to the working class. This norther was also felt at Tampico."

If now we turn to the United States Weather Maps we find that an area of cold northerly winds was advancing rapidly southward on the 2d and 3d from the Dakotas, Colorado, and New Mexico to the Texas coast. The front line of this cold wave is the region where comparatively warm southerly winds are suddenly displaced by the under-running current of cold northerly winds. This is the front of the norther, and its progress may be distinctly traced by the shifting of the winds at the Weather Bureau stations. I have drawn lines showing the progress of this advancing norther during the 2d and 3d, which are introduced on map No. I, and show that although its progress was quite uniform over the land area at a rate of about 40 miles per hour in a south-easterly direction from the 2d, 8 a. m., until the 3d, 2 a. m., and even after that, as it passed over the Atlantic States and the mainland of Mexico; yet the moment this air reached the Gulf coast between Galveston and Corpus Christi it doubled its rate of advance toward the south and reached Vera Cruz at 10.30 a. m. of the 3d, or eight hours after leaving Galveston and Corpus Christi, being at the rate of about 80 miles per hour. It probably reached Frontera, Mexico, and Campeche and the west coast of Yucatan within an hour after touching Vera Cruz. Through the central portion of the region of flow the winds must have been north-northeast and north-northwest, as shown by the northerly arrows; to the east of this region the winds would incline to northwest, while to the west of this center they would incline to northeast, as, in fact, is also observed to be the case with the winds at stations on land. The north and northeast winds between Vera Cruz and Tampico produce the temporary whirls and gusty weather experienced along that coast. The north and northwest winds experienced from Campeche to Florida on the 3d and 4th must have conspired with the rotation of the earth to increase the circulation around a storm-center that was apparently east of Florida and north of Cuba on the 4th, 8 p. m., and that subsequently developed into low area No. IV of the United States series. Thus, the norther on the coast of Mexico is an incident in the flow of cold air, as it followed behind low area No. I and moved onward to meet low area No. IV. But, in accordance with what little

we know of the mechanics of the atmosphere, it does not seem proper to consider either of these low areas as the cause of the inflow of this northerly wind, or of the high barometer and low temperature that attended it; on the contrary, it is more rational to keep in mind the great areas of moderately low pressure and to say that the descent of air into these from the areas of high pressure usually initiates the whirls and special lows that we call storm-centers.

TEMPERATURE OBSERVATIONS AT THOMPSON, WINDHAM CO., CONN.

Miss Ellen D. Larned communicates the following summary of her observations at Thompson, Conn., N. 41° 55', W. 71° 50'. She states that her record began January 1, 1852, and has been continued uninterruptedly, except during the years 1884-85: "I have taken great pains with the observations and summaries and think that they are mainly accurate. I was absent in June, 1853, but the maximum temperature for that month was recorded by my parents. My thermometer hangs in the same shelter as at first, but the trees have heavier foliage so that for a number of years the mercury has not risen so high as formerly, and since June 24, 1884, it has not risen above 90°, but it is perfectly open on all sides and the position is a good one. The exact location is on a hill in the town of Thompson." Miss Larned is well known as the author of the "History of Windham County," one of the most important county histories that has been published. This county has been settled since 1680, and it would be very interesting if some one as familiar with the subject as Miss Larned could gather together the scattered items that may be on record, and which would present a nearly complete history of the climate and meteorological phenomena during the past 200 years. A list of "coldest days" at Thompson will be found in the MONTHLY WEATHER REVIEW for May, 1888.

Summary of temperature observations, 1852 to 1894 (omitting 1884 and 1885), at Thompson, Windham Co., Conn., by Miss Ellen D. Larned.

Month.	Mean temperature.	Extremes of monthly means.				Extreme observed temperatures.			
		Maxima.		Minima.		Maxima.		Minima.	
		Year.	Mean.	Year.	Mean.	Year.	Day.	Temp.	Year.
January....	22.46	1880	33.22	1857	10.80	1876	1	68	1857
February ..	26.01	1857	33.50	1875	19.20	1857	25	64	1861
March.....	31.05	1871	39.88	1872	24.35	1861	30	73	1863
April.....	44.30	1878	49.76	1874	36.68	1861	23	84	1872
May.....	56.00	1880	62.33	1882	49.27	1880	26	91	1882
June.....	65.16	1865	69.40	1881	59.77	1863	.....	95	1859
July.....	69.89	1887	74.54	1859	64.89	1866	16	95	1859
August....	67.36	1870	71.77	1859	61.49	1864	1	93	1855
September.	60.60	1881	66.20	1860	56.12	1881	7	91	1856
October....	49.40	1879	54.63	1868	42.82	1884	4	78	1879
November..	38.58	1870	43.12	1873	30.15	1860	1	73	1875
December..	27.95	1091	35.80	1872	10.64	1889	25	62	1883

Annual mean temperature at Thompson, Windham Co., Conn., so far as reports are at hand in the archives of the Weather Bureau.

Year.	Mean.	Year.	Mean.	Year.	Mean.	Year.	Mean.	Year.	Mean.
1852.....	46.8	1861.....	44.5	1869.....	46.9	1877.....	49.0	1885.....	.....
1853.....	.....	1862.....	46.7	1870.....	49.6	1878.....	49.0	1886.....	46.6
1854.....	47.4	1863.....	.....	1871.....	.....	1879.....	47.4	1887.....	.....
1855.....	48.5	1864.....	47.4	1872.....	46.3	1880.....	49.1	1888.....	44.4
1856.....	45.2	1865.....	45.7	1873.....	45.7	1881.....	47.0	1889.....	47.8
1857.....	45.6	1866.....	47.2	1874.....	40.5	1882.....	46.2	1890.....	46.4
1858.....	45.1	1867.....	.....	1875.....	.....	1883.....	.....	1891.....	47.6
1859.....	45.0	1868.....	44.9	1876.....	47.4	1884.....	.....	1892.....	46.2
1860.....	46.4	.....	.....	.....	.....	.....	.....	.....	46.8
Average.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

THE OBSERVATION OF THE HIGHEST CLOUDS.

An observer at Potosi, Mo., reports that, at 5.30 a. m., December 16, there appeared in the sky nearly overhead a bright redness of a tint like that of the rising sun; it lasted for about fifty seconds; it covered an area whose outline was that of the figure known in geometry as a "lune," whose southern vertex was southeast of the zenith, at a point corresponding to the position of the sun at 11 a. m., and whose northern vertex was about the same distance northeast of the zenith, so that its axis lay almost directly north and south. This reddish light was not caused by a comet or meteor, as many supposed, nor was it an auroral light, but was evidently the illumination by the sun's rays of a high, delicate cirrus cloud. On that morning a region of clear, cold air was moving eastward over Missouri and all the clouds above Potosi (N. 38°, W. 90°) must have been composed of snow or ice spicule whose reflections are more perfect than those from globules of water that form ordinary cumulus clouds. The region to the east of Potosi for several hundred miles had experienced rain or snow and was covered with moist and cloudy air; the sun's rays, as seen through such an atmosphere in the early morning are generally of a cherry red color, due to the absorption of the more refrangible green and

blue rays by the moist atmosphere. At 5.30 a. m., December 15, at Potosi, it is about 1 hour and 40 minutes before sunrise, and allowing for the refraction by the air we find that if the cherry-tinted rays of the sun were at that time to illuminate a cloud in the position seen by the observer at Potosi the cloud must have had an altitude of at least 10 miles. In the course of a few minutes after sunrise we ordinarily observe the cherry tint of the sun's disc to become yellow and finally white, owing to the fact that its rays no longer pass through such a long stretch of the dense lower atmosphere. In the same way at Potosi the reddish-tinted cloud, in the course of a minute, begins to be illuminated by the rays of the purer sunlight and appears pale white instead of red, and becomes indistinguishable from the general whitish haze of the sky. This accounts for the fact that the observer saw the haze last for only about fifty seconds. At this time the sun was about 18° below the horizon.

In order to determine the heights of the highest cirrus clouds only two methods have as yet been successfully attempted, namely, the measurement of altitude and azimuth by two or more observers some distance apart, or otherwise the determination of the exact time at which clouds are first seen illuminated by the morning sun, or last seen by the setting sun, coupled with which should be an approximate determination of the altitude and azimuth of the cloud. In the clear sky of the early morning, and especially in the dry weather of summer, observers will be surprised to find how very early in the morning these delicate clouds may be observed, whence it follows that they must be correspondingly high, in fact at latitude 52° and on the 20th and 22d of June they are reported to have been seen at midnight when the sun is only 15° below the northern horizon.

THERMAL BELTS, FROSTLESS BELTS, OR VERDANT ZONES.

These are local names given to certain regions on mountain sides within which nocturnal frost rarely or never occurs in the spring time, although freezing temperatures occur in the winter time, consequently tender vegetation flourishes with remarkable vigor in these regions. The following are the only references to thermal belts in the United States at present known to the editor, but as such regions are especially important to the horticulturist and agriculturist it is hoped that the correspondents of the Weather Bureau will bring these thermal belts to notice wherever they occur in order that their meteorological peculiarities may be better understood.

In the Agricultural Report of the Patent Office for 1861, Mr. Silas McDowell, of Franklin, Macon Co., N. C., describes the verdant zone in that county in the valley of the Little Tennessee River; it occupies the region between 300 and 700 feet above the valley of the river, which latter is about 2,000 feet above sea level; on tracing this zone up among the smaller tributaries of the Tennessee River, he found that in the higher valleys, where the bottom land is about 3,900 feet above sea level, the verdant zone lies between 4,000 and 4,100. Within this zone frost never injures the vegetation and the most tender grapes never fail to produce abundant crops.

Prof. J. W. Chickering, Jr., in the bulletin of the Philosophical Society of Washington, March, 1883, and in the American Meteorological Journal, Vol. I, describes the following thermal belts:

In Polk County, N. C., along the eastern slope of the Tryon Mountain range, in latitude $N. 35^{\circ}$, the thermal belt begins at the base of the mountain, at an elevation of 1,200 feet above the sea, and extends up 2,200 feet, being most perfect at about 1,500. It is about 8 miles long, and distinguished by magnificent flora such as would be characteristic of a point 3° south of the actual latitude.

Prof. John Leconte, of Berkley, Cal., in Science, Vol. I, p. 278, states that at Flat Rock, near Hendersonville, Henderson Co., N. C., on the flank of the mountain spur adjacent to the valleys of the Blue Ridge, he has also observed a frostless zone; the valley is about 2,200 feet above sea level, and the thermal belt is 200 or 300 feet above the valley.

Mr. J. W. Pike, of Vineland, N. J., states that among the mountains of California he has observed that during the night the cold is much greater in the valleys than on the terraces several hundred feet above, due to the settling of the cold air, so that a thermal belt is formed at that height separating the frosty valleys from the colder highlands.

In the Tennessee Journal of Meteorology for January, 1894, published by that State Weather Service, the author describes a thermal belt between Los Angeles and the Pacific Ocean; it traverses the foot hills of the Cahuenga range and has an elevation of between 200 and 400 feet, and a breadth of about 3 miles; it occupies the midway region of the range.

In the American Meteorological Journal, Vol. I, Mr. S. Alexander describes a thermal belt, in which the peach tree flourishes, in the southeastern portion of Michigan; he shows that the cold island discovered by Winchell in that region is really the bottom of a topographical depression into which the cold air settles; it is a long valley surrounded by a belt of elevated country from 50 to 600 feet above lakes Michigan and Huron. The valley and the isotherms trend northeast and southwest from Huron County through Sanilac, Lapeer, Oakland, Livingston, and Washtenaw to Hillsdale counties. The highlands of this region are all much freer from frost than the lowlands, and all much more favorable to early vegetation. He does not state that any point is high enough to be above the thermal belt, but that, in general, two equal parallel thermal belts inclose the cold island between them.

It is generally conceded that these thermal belts depend both upon the drainage of cold air downward into the lower valleys and the freedom of radiation from the surface of the ground to the clear sky overhead. During a still night when frosts occur the surface of the hillside cools by radiation and hence cools the air in contact with it; the latter flows downward as long as its cooling by radiation and conduction exceeds its dynamic warming by com-

pression. Inasmuch as its cooling depends on contact with a still colder soil or plant it soon accumulates in the lowlands as a layer of cold air, which grows thicker during the night by the steady addition of the thin layer of descending air in contact with the ground on the hillsides. The warmer air, that has not yet had an opportunity to cool by contact with the ground, floats on top of the cold mass; it spreads out toward the hills, and is continuously furnishing its heat to the adjacent hillsides as fast as it comes in contact with them before it also cools and descends. The formation of the thermal belt seems to depend largely upon this gentle circulation during the night time. The lower limit of the belt is defined by the depth of the accumulation of cold air in the confined valley and rises higher in proportion as the night is clearer and longer, and also in proportion as the valley is more or less perfectly inclosed; the upper limit of the thermal belt may depend upon the strength of the wind and the general temperature of the air, but if there be no wind then it depends equally on the freedom of radiation to the clear sky and on the above-described circulation of air.

A COMPARISON OF PREVAILING AND RESULTANT WINDS.

Owing to the labor involved in computing the resultant wind for each month, it has been the custom to select the wind that occurs most frequently and speak of that as the prominent feature in the wind movement at each station; such so-called prevailing winds have been published on Chart No. II of the *MONTHLY WEATHER REVIEW* during the preceding years, in connection with the isobars and isotherms for each month. It is, however, evident that if the isobars and winds that prevail at any moment are to be compared with each other then equally must the mean isobar and the mean wind of the month or year be compared. If there were but slight changes in barometric pressure and wind direction at any station during the month, the inclination of the mean wind to the mean isobar would be a simple linear function of the inclinations shown on the individual simultaneous maps, but as pressure, and especially wind direction, go through a wide range of diurnal, annual, and non-periodic changes, it is not necessary that any simple relation should hold good between the monthly means and the individual values, except in seasons of steady winds. By the mean direction of the wind must be understood a resultant based upon all individual observations and already, many years ago, meteorologists had discussed the question as to how this resultant could best be computed.

Prof. J. H. Coffin, in his "Winds of the Northern Hemisphere," Washington, 1853, showed by an extensive computation that no great error would be produced in the climatological results that he published if Lambert's formula, or some equivalent analysis of the winds, be applied on the assumption that the wind blows with equal force or velocity from each of the recorded directions. In order to establish this generalization it was necessary for him to calculate the resultants, both for the actual observed wind force and direction, and again for the assumed uniform velocities; this calculation he carried out for observations during 397 months at 103 different places. In 1857 he executed a more extensive discussion of the subject, based on an aggregate of 8,589 months at 418 places on the American continent, the observations having usually been made three times a day; the result of this great work is given in Coffin's "Winds of the Globe," Washington, 1875, pp. 638-656, where the discussion is also extended to include the movements of the clouds. By charting his results he was able to show that both the magnitude and the direction of the "resultant wind movement," computed by taking strict account of the velocity of the wind, differed systematically from the magnitude and direction of the "resultant wind direction," computed by assuming all winds to have an equal velocity. These differences may be considered small and negligible in a general survey of the climatology of the globe, but become important when we study the laws of the mechanics of the atmosphere.

The establishment of "double registers" and "triple registers," giving continuous records of the direction and movement of the wind at 67 stations of the Weather Bureau (the other stations have registers of movement only), furnishes material for a more thorough investigation of this subject within the United States than was practicable to Prof. Coffin, who relied mostly upon observations taken three times a day in all parts of the world. It is now proposed to analyze the wind records and deduce the resultants for these 67 stations of continuous registration, and to publish the results monthly in this *REVIEW* during 1894. The first point I shall consider is how nearly the resultant movement, calculated by giving a proper weight to each velocity, will agree with the resultant direction, calculated by assuming a uniform velocity. As nothing definite can be at present stated in respect to this question, more than what has been given by Coffin in 1875, and by Supan in 1881 in his "Statistics of the Lower Atmospheric Circulation," and as it seems on the other hand necessary to print in connection with the monthly isobars something more appropriate than the "prevailing wind" deduced from observations at 8 a. m. and 8 p. m., it is proposed to publish monthly during 1894 on Chart No. II the "resultant wind directions" deduced from the 8 a. m. and 8 p. m. observations, and to substitute, at some future time, such further improvements as may be shown to be necessary after a study of the "resultant wind movements" deduced from self-registers.

The resultant movements for the 67 stations of self-registration based upon the hourly readings of the anemographs, or on about 720 observed hourly movements in a month of 30 days, will be given in tabular form about as in the present article; the resultants for the remaining regular Weather Bureau stations must necessarily be based upon the observations made at 8 a. m. and 8 p. m., 75th meridian time (or the hours for which the weather maps are compiled daily), and they will therefore need a correction to make them comparable with the results of self-registration and with the monthly

mean isobars; this correction must be determined empirically when sufficient data have accumulated.

The following table (A) contains the necessary data from each self-register for the month of December, 1893; the contents of the columns are as follows: Columns 2 and 3—the prevailing wind, viz., that most frequently observed, its direction, and duration in hours. Columns 4 and 5—the total movement in all directions for 744 hours and the average hourly movement found by dividing by 744. Column 6—the "resultant direction," assuming the wind to have always a uniform velocity; this is equivalent to giving each hour of wind and calm alike the same weight, and as the few blanks that occur in the registers have been approximately interpolated, or uniformly distributed, this resultant may be assumed to be based on the complete month. Column 7—the duration in hours of this resultant, considered as a wind that has blown with the average velocity that was implied in the above assumption of a uniform velocity. Column 8—the approximate average velocity in this resultant direction, found by dividing the resultant movement, expressed in miles in column 10, by the resultant duration, expressed in hours in column 7. Column 9—the direction of the "resultant movement," computed by using

the miles actually traveled each hour, as read from the registers. Column 10—the resultant movement itself in miles. Column 11—the azimuth of the resultant movement will differ from the azimuth of the resultant direction in proportion as the wind velocities are unequally distributed among the points of the compass; the difference of these two azimuths is given in column 11; azimuths are counted around the circle from zero at the south through 90° at the west, and if the azimuth of the resultant movement is greater than that of the resultant direction the difference in column 11 is called positive; the azimuth of the movement is equal to that of the direction plus the positive, or minus the negative, differences given in column 11; these differences are usually quite small, but the extreme range is from plus 39° to minus 47° and, on being charted, they are seen to be grouped together in such a way as to indicate that the stronger winds in one portion of the country are more northerly, southerly, easterly, or westerly than is consistent with the assumption of a uniform wind; thus it happens that the resultant movement differs systematically from the resultant direction for at least two reasons, i. e., (1) very local peculiarities of instrumental exposure and topographic contour, (2) very general peculiarities of the atmospheric circulation and the paths of high

TABLE A.—*Pervailing and resultant winds from self-registers for December, 1893.*

Station.	Prevailing wind.		Total movement.		Resultant direction.		Resultant movement.		Azimuth of movement minus direction.	Ratio of resultant movement to total movement.	
	Direction from.	Duration.	Monthly.	Hourly average.	Direction from.	Duration.	Average hourly velocity.	Direction from.	Movement.		
(1)	(2)	(3) Hours.	(4) Miles.	(5) Miles.	(6)	(7) Hours.	(8) Miles.	(9)	(10) Miles.	(11) °	(12)
Abilene, Tex.	S.	179	9,619	12.9	S. 42 W.	215	17.0	S. 36 W.	3,675	-6	0.382
Albany, N. Y.	B.W.	213	6,259	8.4	B. 84 W.	165	9.5	S. 85 W.	1,560	-11	0.249
Alpena, Mich.	B.W.	174	8,100	10.9	S. 81 W.	279	9.2	S. 78 W.	2,560	-3	0.316
Atlanta, Ga.	B.W.	197	7,901	10.6	S. 77 W.	151	14.5	B. 87 W.	2,190	+16	0.277
Augusta, Ga.	B.W.	135	4,442	6.0	B. 45 W.	135	10.0	B. 58 W.	1,350	-13	0.304
Baltimore, Md.	B.W.	170	5,798	7.8	S. 69 W.	211	14.0	B. 82 W.	2,742	+8	0.473
Bismarck, N. Dak.	B.W.	251	7,134	9.6	S. 13 W.	127	18.4	B. 22 W.	2,332	-9	0.347
Boston, Mass.	W.	245	8,700	11.8	S. 84 W.	455	10.1	B. 79 W.	4,602	+5	0.525
Buffalo, N. Y.	W.	172	11,535	15.5	S. 55 W.	303	23.6	S. 88 W.	7,142	-7	0.619
Chicago, Ill.	W.	254	16,387	22.0	S. 69 W.	415	23.6	S. 61 W.	9,780	-5	0.597
Cincinnati, Ohio.	B.W.	186	7,009	9.4	S. 45 W.	258	12.3	S. 66 W.	3,175	+21	0.453
Cleveland, Ohio.	W.	199	12,675	17.0	S. 15 W.	322	17.8	B. 19 W.	5,723	+4	0.452
Columbus, Ohio.	W.	207	9,314	12.5	S. 58 W.	300	15.5	S. 64 W.	4,651	+6	0.499
Colorado Springs, Colo.	N.	310	6,840	9.2	B. ..	281	11.3	B. 16 W.	3,106	-16	0.402
Davenport, Iowa	W.	207	8,399	11.3	S. 60 W.	353	13.7	S. 65 W.	4,850	+5	0.577
Denver, Colo.	S.	192	6,450	8.7	S. 68 W.	213	11.1	S. 88 W.	2,370	+20	0.397
Des Moines, Iowa.	B.W.	198	6,198	8.3	S. 80 W.	242	8.1	B. 81 W.	2,475	-1	0.399
Detroit, Mich.	SW.	305	10,430	14.0	S. 73 W.	369	17.3	S. 72 W.	6,400	-1	0.613
Dodge City, Kans.	B.W.	209	8,184	11.0	S. 58 W.	128	7.8	S. 74 W.	1,000	-48	0.122
Duluth, Minn.	B.	180	5,073	6.8	B. 50 W.	275	7.3	B. 38 W.	2,000	+12	0.394
Eastport, Me.	B.W.	202	9,848	13.2	B. 58 W.	353	11.8	B. 39 W.	4,150	+19	0.421
El Paso, Tex.	B.W.	327	6,390	8.6	B. 32 W.	293	12.1	B. 30 W.	3,420	-4	0.535
Galveston, Tex.	SE.	207	8,189	11.7	S. 40 E.	179	6.1	S. 53 E.	1,084	-13	0.124
Grand Haven, Mich.	SW.	201	10,409	14.1	S. 75 W.	135	25.1	S. 68 W.	3,800	-7	0.362
Havre, Mont.	SW.	259	7,694	10.3	S. 81 W.	325	14.9	S. 70 W.	4,850	-11	0.611
Helena, Mont.	W.	416	6,326	8.5	S. 60 W.	560	10.1	S. 50 W.	5,050	-4	0.893
Huron, S. Dak.	B.W.	223	9,489	12.8	S. 24 W.	88	15.8	B. 32 W.	1,392	-8	0.147
Indianapolis, Ind.	B.W.	169	5,717	7.7	S. 50 W.	298	7.9	S. 54 W.	3,303	+4	0.413
Jacksonville, Fla.	NE.	196	5,330	7.2	S. 7 W.	220	4.0	B. 10 W.	855	-9	0.165
Kansas City, Mo.	S.	182	8,103	19.7	S. 31 W.	168	14.3	S. 33 W.	2,408	+2	0.295
Keeler, Cal.	SE.	135	3,773	5.1	S. 66 E.	117	3.0	B. 19 E.	354	-47	0.094
Key West, Fla.	NE.	410	9,332	12.5	S. 59 E.	510	13.4	B. 50 E.	6,817	-9	0.731
Knoxville, Tenn.	NE.	200	4,017	5.4	S. 35 W.	174	8.3	B. 80 W.	1,437	-42	0.350
Lynchburg, Va.	SW.	223	3,349	4.5	S. 79 W.	228	6.5	B. 83 W.	1,487	+18	0.444
Marquette, Mich.	W.	316	5,714	11.7	S. 85 W.	366	10.4	B. 85 W.	3,800	+10	0.435
Memphis, Tenn.	B.W.	147	6,057	8.1	S. 20 W.	98	6.8	S. 51 W.	665	+31	0.110
Milwaukee, Wis.	B.W.	244	8,971	12.1	.. W.	327	12.2	B. 89 W.	3,960	+1	0.444
Moorhead, Minn.	B.	224	8,294	11.1	B. 41 W.	167	8.1	B. 40 W.	1,350	+1	0.163
Nantucket, Mass.	B.W.	200	9,644	13.0	S. 26 W.	285	13.2	B. 13 W.	3,750	+15	0.389
Nashville, Tenn.	B.W.	160	5,006	0.7	S. 17 W.	75	14.5	S. 54 W.	1,087	+37	0.237
New Haven, Conn.	SW.	187	6,725	9.0	N. 60 W.	282	9.6	B. 56 W.	2,700	+4	0.401
New Orleans, La.	SE.	141	6,570	9.2	.. E.	184	6.7	B. 54 E.	1,210	-37	0.181
New York, N. Y.	SW.	215	8,598	11.6	S. 64 W.	301	13.1	B. 79 W.	3,940	+15	0.459
Norfolk, Va.	SW.	190	7,037	9.5	S. 78 W.	190	13.3	S. 65 W.	2,531	-17	0.359
Olympia, Wash.	S.	477	4,130	6.0	S. 6 W.	492	7.5	S. 7 W.	3,763	+1	0.834
Omaha, Nebr.	B.W.	201	5,945	8.0	S. 75 W.	127	8.4	S. 84 W.	1,004	+9	0.179
Philadelphia, Pa.	SW.	223	8,168	10.9	S. 88 W.	288	12.6	B. 72 W.	3,625	+10	0.444
Pikes Peak, Colo.	W.	222	21,216	32.5	B. 62 W.	315	41.3	B. 77 W.	13,000	-15	0.537
Pittsburg, Pa.	W.	223	5,985	8.0	B. 62 W.	378	9.2	S. 69 W.	3,487	+7	0.550
Portland, Me.	B.W.	227	5,640	7.6	S. 69 W.	420	7.8	B. 66 W.	3,233	+3	0.572
Portland, Oregon.	S.	189	6,224	8.4	S. 23 W.	255	13.1	S. 28 W.	3,350	+5	0.539
Rochester, N. Y.	SW.	189	7,192	9.7	S. 48 W.	390	11.6	S. 54 W.	4,525	+6	0.629
Roseburg, Oregon.	SE.	161	1,950	8.7	S. 35 E.	185	3.6	S. 23 E.	675	+15	0.341
Saint Louis, Mo.	S.	167	10,450	14.0	S. 37 W.	191	21.8	S. 40 W.	4,107	+9	0.400
Saint Paul, Minn.	SW.	164	5,759	7.7	S. 69 W.	133	12.6	N. 88 W.	1,677	+23	0.291
Salt Lake City, Utah.	B.W.	205	3,256	4.4	S. 11 E.	145	4.1	S. 28 W.	593	+39	0.182
San Diego, Cal.	SE.	171	3,347	4.5	S. 8 W.	233	3.8	S. 24 W.	884	-16	0.266
San Francisco, Cal.	B.W.	158	4,491	6.0	N. 63 W.	101	7.2	B. 72 W.	730	-9	0.385
Santa Fe, N. Mex.	SE.	203	5,112	6.9	S. 38 E.	155	9.2	B. 11 E.	1,419	-38	0.278
Sault Ste. Marie, Mich.	SE.	214	6,535	8.8	.. E.	103	8.7	N. 83 E.	930	-7	0.142
Savannah, Ga.	B.W.	157	6,091	8.2	S. 32 W.	139	8.8	N. 50 W.	1,230	-24	0.202
Spokane, Wash.	SW.	180	3,988	5.4	S. 49 W.	120	15.9	S. 22 W.	1,905	-27	0.475
Toledo, Ohio.	SW.	205	9,556	12.9	S. 62 W.	354	14.3	S. 59 W.	5,052	-3	0.529
Vicksburg, Miss.	SE.	208	5,840	7.8	S. 64 E.	162	7.1	S. 36 E.	1,153	+28	0.197
Washington, D. C.	S.	187	5,032	6.8	S. 83 W.	187	10.5	N. 77 W.	1,060	+20	0.399
Wilmington, N. C.	SW.	191	6,109	8.6	N. 74 W.	223	9.3	N. 83 W.	3,073	-11	0.333
Yuma, Ariz.	B.	273	4,929	6.6	N. 12 W.	350	7.6	N. 3 E.	2,994	-9	0.607

and low centers; in December, 1893, positive differences are largely confined to the upper and lower Mississippi, the lower Missouri, and the Ohio valleys, the Middle States, and New England; another positive group extended from San Francisco, Cal., to Olympia, Wash., and these groups are connected by a belt of positives represented by Salt Lake City, Utah, Denver Col., and Omaha, Nebr.; the negative differences lie mostly north and south of these regions of positive differences. Column 12—if the wind movements were equal from each opposing pair of points of the compass the resultant movement in column 10 would be zero no matter how large the total movements in column 4 might be; therefore, the ratio of column 10 divided by column 4 gives an approximate idea of the extent to which the resultant movement or resultant direction has prevailed over the other winds of the month; this ratio would be unity in the ideal case of wind blowing from one single direction only, as is very nearly the case in the midst of the trade-wind region; the ratio would be zero in the ideal case of opposing day and night breezes of equal strength; during December, 1893, column 12 shows large ratios at Helena, Mont., Key West, Fla., and Olympia, Wash., and small ratios at Keeler, Cal., Memphis, Tenn., Dodge City, Kans., and Sault Ste. Marie, Mich.; on charting these ratios we perceive that in mountainous countries the topography has much to do with increasing the numbers, but that in a level country they depend upon what are called the "steady movements" of the atmosphere, viz., either a steady flow in one direction, as in the northeast trades, or a steady flow in re-entrant curves, as in the diurnal land and sea, mountain and plain breezes, or the monthly monsoon breezes.

Table B gives, for 140 stations, or all that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions, based on these two observations only; the total movement for the whole month, as read from the dial of the Robinson anemometer, is given in the table of climatological data; any deductions that may be drawn from the study of the continuous registers at 67 stations can, therefore, be applied to the data from all other stations, as given in Table B. By adding the four components for the stations comprised in each geographical division we can obtain the average resultant direction for that region, and in the same way we may obtain the average for the whole United States.

TABLE B.—*Resultant winds from observations at 8 a. m. and 8 p. m. daily, or 62 hours, during December, 1893.*

Number.	Station.	Component direction from—				Resultant direction.	
		N.	S.	E.	W.	From.	Hours.
	<i>New England.</i>					0	
1	Eastport, Me.	24	10	10	34	n. 60 w.	28
2	Portland, Me.	22	14	2	39	n. 78 w.	38
3	Northfield, Vt.	23	22	2	11	n. 84 w.	9
4	Boston, Mass.	18	12	4	41	n. 80 w.	37
5	Nantucket, Mass.	33	13	10	21	n. 29 w.	23
6	Woods Hole, Mass.	10	5	2	19	n. 74 w.	18
7	Block Island, R. I.	27	12	9	33	n. 58 w.	28
8	New Haven, Conn.	26	12	7	31	n. 60 w.	28
9	New London, Conn.	25	13	4	35	n. 68 w.	33
	<i>Middle Atlantic states.</i>					0	
10	Albany, N. Y.	20	24	6	19	s. 73 w.	14
11	New York, N. Y.	16	26	6	26	s. 70 w.	23
12	Harrisburg, Pa.	15	15	19	25	... w.	6
13	Philadelphia, Pa.	20	15	8	29	n. 85 w.	21
14	Atlantic City, N. J.	20	17	6	37	n. 83 w.	26
15	Baltimore, Md.	19	19	10	29	... w.	19
16	Washington, D. C.	23	23	6	17	... w.	11
17	Lynchburg, Va.	16	16	14	30	... w.	16
18	Norfolk, Va.	21	21	10	25	... w.	15
	<i>Atlantic states.</i>					0	
19	Charlotte, Va.	14	27	19	23	s. 12 w.	13
20	Hatteras, N. C.	23	15	10	30	n. 68 w.	22
21	Kittyhawk, N. C.	20	16	11	30	n. 78 w.	20
22	Raleigh, N. C.	22	23	5	29	s. 88 w.	24
23	Southport, N. C.	27	6	9	31	n. 46 w.	30
24	Wilmington, N. C.	22	20	10	27	n. 83 w.	17
25	Charleston, S. C.	26	17	14	19	n. 29 w.	10
26	Augusta, Ga.	24	13	15	21	n. 29 w.	13
27	Savannah, Ga.	24	16	14	23	n. 48 w.	12
28	Jacksonville, Fla.	33	12	13	17	n. 11 w.	21
	<i>Florida peninsula.</i>					0	
29	Jupiter, Fla.	24	12	26	16	n. 40 e.	16
30	Key West, Fla.	33	6	37	4	n. 50 e.	43
31	Tampa, Fla.	35	10	23	10	n. 28 e.	28
32	Titusville, Fla.	29	13	14	26	n. 37 w.	20
	<i>Eastern Gulf states.</i>					0	
33	Atlanta, Ga.	17	19	15	27	s. 81 w.	12
34	Pensacola, Fla.	27	18	21	11	n. 48 e.	14
35	Mobile, Ala.	30	14	10	16	n. 21 w.	17
36	Montgomery, Ala.	24	16	17	19	n. 14 w.	8
37	Meridian, Miss.	28	16	18	12	n. 27 e.	13
38	Vicksburg, Miss.	20	19	29	12	n. 87 e.	17
39	New Orleans, La.	20	20	26	8	... e.	18
	<i>Western Gulf states.</i>					0	
40	Shreveport, La.	14	27	21	14	s. 28 e.	15
41	Fort Smith, Ark.	14	11	34	13	n. 82 e.	21
42	Little Rock, Ark.	19	22	15	23	s. 67 w.	8
43	Corpus Christi, Tex.	21	25	26	9	s. 77 e.	20
44	Galveston, Tex.	13	30	25	16	s. 28 e.	19
45	Palestine, Tex.	22	19	17	19	n. 34 w.	4
46	San Antonio, Tex.	23	20	21	14	n. 74 e.	7
	<i>Ohio Valley and Tennessee.</i>					0	
47	Chattanooga, Tenn.	21	24	14	18	s. 53 w.	5
48	Knoxville, Tenn.	24	13	17	23	n. 24 w.	13
49	Memphis, Tenn.	19	24	16	18	s. 22 w.	5
50	Nashville, Tenn.	19	25	19	16	s. 27 e.	7
51	Lexington, Ky.	18	26	10	34	s. 70 w.	24

TABLE B.—*Resultant winds from observations, etc.*—Continued

Number.	Station.	Component direction from—				Resultant direction.	
		N.	S.	E.	W.	From.	Hours.
52	<i>Ohio Valley and Tennessee—Cont'd.</i>						
52	Louisville, Ky.	15	29	11	31	S. 36 W.	17
53	Indianapolis, Ind.	12	28	10	25	S. 43 W.	23
54	Cincinnati, Ohio	14	23	14	24	S. 48 W.	12
55	Columbus, Ohio	15	24	8	26	S. 63 W.	20
56	Pittsburg, Pa.	10	25	9	33	S. 58 W.	26
57	Parkersburg, W. Va.	7	30	11	25	S. 32 W.	27
	<i>Lower Lake region.</i>						
58	Buffalo, N. Y.	20	16	7	35	N. 82 W.	26
59	Oswego, N. Y.	12	29	13	22	S. 28 W.	19
60	Rochester, N. Y.	8	31	8	33	S. 47 W.	14
61	Erie, Pa.	12	31	3	31	S. 56 W.	34
62	Cleveland, Ohio	10	35	14	18	S. 9 W.	34
63	Sandusky, Ohio	10	24	5	37	S. 66 W.	35
64	Toledo, Ohio	11	29	7	33	S. 55 W.	34
65	Detroit, Mich.	13	23	10	35	S. 68 W.	27
	<i>Upper Lake region.</i>						
66	Alpena, Mich.	18	20	9	30	S. 85 W.	21
67	Grand Haven, Mich.	17	20	15	28	S. 77 W.	13
68	Marquette, Mich.	13	17	4	36	S. 83 W.	32
69	Port Huron, Mich.	15	24	6	33	S. 72 W.	29
70	Sault Ste. Marie, Mich.	18	17	30	14	S. 87 E.	16
71	Chicago, Ill.	13	23	3	36	S. 73 W.	34
72	Milwaukee, Wis.	21	20	7	30	S. 88 W.	23
73	Green Bay, Wis.	21	24	7	22	S. 79 W.	15
74	Duluth, Minn.	25	13	10	28	N. 56 W.	22
	<i>Extreme Northwest.</i>						
75	Moorhead, Minn.	28	20	8	15	N. 41 W.	11
76	Saint Vincent, Minn.	32	16	10	7	N. 11 E.	16
77	Bismarck, N. Dak.	26	11	18	19	N. 4 W.	15
78	Williston, N. Dak.	16	19	16	20	S. 53 W.	5
	<i>Upper Mississippi Valley.</i>						
79	Saint Paul, Minn.	19	17	14	27	N. 81 W.	13
80	La Crosse, Wis.	10	20	14	19	S. 79 W.	5
81	Davenport, Iowa	8	21	8	34	S. 64 W.	29
82	Des Moines, Iowa	17	13	12	31	N. 75 W.	20
83	Dubuque, Iowa	15	22	10	27	S. 68 W.	18
84	Keokuk, Iowa	15	26	8	37	S. 60 W.	22
85	Cairo, Iowa	19	30	10	15	S. 25 W.	12
86	Springfield, Ill.	16	27	6	24	S. 58 W.	21
87	Hannibal, Mo.	16	25	8	26	S. 63 W.	20
88	Saint Louis, Mo.	14	27	15	20	S. 21 W.	14
	<i>Missouri Valley.</i>						
89	Columbin, Mo.	10	12	5	13	S. 76 W.	8
90	Kansas City, Mo.	17	26	13	17	S. 20 W.	12
91	Springfield, Mo.	18	30	15	16	S. 5 W.	12
92	Omaha, Nebr.	17	22	13	21	S. 58 W.	10
93	Valentine, Nebr.	20	10	6	38	S. 72 W.	34
94	Sioux City, Iowa	25	18	20	16	S. 39 E.	7
95	Pierre, S. Dak.	22	17	24	18	S. 50 E.	8
96	Huron, S. Dak.	25	18	18	19	S. 8 W.	7
97	Yankton, S. Dak.	23	15	16	26	N. 52 W.	13
	<i>Northern slope.</i>						
98	Havre, Mont.	17	17	12	36	... W.	24
99	Miles City, Mont.	11	21	17	21	S. 22 W.	11
100	Helena, Mont.	3	27	1	44	S. 61 W.	48
101	Rapid City, S. Dak.	15	10	13	36	N. 78 W.	25
102	Cheyenne, Wyo.	24	9	4	36	N. 65 W.	35
103	Lander, Wyo.	9	27	9	30	S. 50 W.	28
104	Kearney, Nebr.	20	14	8	33	S. 76 W.	26
105	North Platte, Nebr.	12	19	8	40	S. 78 W.	33
	<i>Middle slope.</i>						
106	Colorado Springs, Colo.	37	10	12	13	N. 2 W.	27
107	Denver, Colo.	31	21	8	27	... W.	19
108	Pikes Peak, Colo.	26	11	4	30	N. 60 W.	30
109	Pueblo, Colo.	14	10	13	32	N. 78 W.	20
110	Concordia, Kans.	14	24	9	28	S. 63 W.	22
111	Dodge City, Kans.	23	21	11	24	N. 81 W.	13
112	Wichita, Kans.	19	32	8	15	S. 28 W.	15
113	Oklahoma, Okla.	15	30	12	16	N. 18 W.	13
	<i>Southern slope.</i>						
114	Abilene, Tex.	20	30	10	17	S. 35 W.	12
115	Amarillo, Tex.	19	28	6	18	S. 53 W.	15
	<i>Southern plateau.</i>						
116	El Paso, Tex.	28	8	17	24	S. 19 W.	21
117	Santa Fe, N. Mex.	23	19	26	8	S. 77 E.	18
118	Tucson, Ariz.	16	23	22	16	S. 41 E.	9
119	Yuma, Ariz.	39	8	15	10	S. 9 E.	31
120	Keeler, Cal.	19	17	20	17	S. 56 E.	4
	<i>Middle plateau.</i>						
121	Winnemucca, Nev.	12	22	21	18	S. 17 E.	10
122	Salt Lake City, Utah	18	18	22	20	... E.	2
	<i>Northern plateau.</i>						
123	Baker City, Oreg.	7	35	25	12	S. 26 E.	30
124	Idaho Falls, Idaho	13	35	6	20	S. 33 W.	26
125	Spokane, Wash.	15	27	12	17	S. 23 W.	13
126	Walla Walla, Wash.	6	36	13	12	S. 2 E.	30
	<i>North Pacific coast region.</i>						
127	Fort Canby, Wash.	7	23	22	20	S. 7 E.	16
128	Olympia, Wash.	6	48	5	8	S. 4 W.	42
129	Port Angeles, Wash.	2	46	7	14	N. 9 W.	45
130	Seattle, Wash.	5	39	19	5	S. 22 E.	37
131	Tatoosh, Island, Wash.	3	31	22	20	S. 4 E.	28
132	Portland, Oreg.	14	31	11	20	S. 28 W.	19
133	Roseburg, Oreg.	9	23	26	15	S. 38 E.	18
	<i>Middle Pacific coast region.</i>						
134	Eureka, Cal.	20	25	14	12	S. 22 E.	5
135	Red Bluff, Cal.	26	16	12	27	S. 56 W.	18
136	Sacramento, Cal.	17	29	19	13	S. 26 E.	13
137	San Francisco, Cal.	20	16	13	23	S. 68 W.	11
	<i>South Pacific coast region.</i>						
138	Fresno, Cal.	20	15	19	21	N. 22 W.	5
139	Los Angeles, Cal.	31	4	21	24	N. 7 W.	27
140	San Diego, Cal.	27	10	14	24	N. 30 W.	20

METEOROLOGICAL TABLES.

*Meteorological record of voluntary and other co-operating observers,
December, 1893.*

Stations.			Temperature. (Fahrenheit.)			Precip'n.			Stations.			Temperature. (Fahrenheit.)			Precip'n.			Stations.			Temperature. (Fahrenheit.)			Precip'n.					
Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean
<i>Alabama.</i>	0	0	0	<i>Ins.</i>			<i>Arkansas—Cont'd.</i>	0	0	0	<i>Ins.</i>			<i>California—Cont'd.</i>	0	0	0	<i>Ins.</i>			<i>California—Cont'd.</i>	0	0	0	<i>Ins.</i>				
Alco	80	23	54.2	Ashdown [†]	76	17	48.1	1.38	Bee Branch [†]	79	14	46.1	0.90	Fall Brook [†]	72	31	50.3	0.98	Esparito [†]	74	31	52.9	1.58	Nordhoff [†]	85	28	53.0	3.45
Bermuda [†]	75	22	51.5	2.10	Blanchard Springs [†]	77	20	49.4	2.00	Brinkley [†]	70	18	45.1	2.52	Farmington [†]	70	31	50.1	1.65	Exeter [†]	72	31	50.3	1.49	Northrop [†]	89	32	50.3	2.37
Birmingham [†]	66 ^a	23 ^a	50.9 ^a	3.06	Carrollton [†]	70	24	55.2	4.87	Camden a [†]	70	18	45.1	2.52	Dardanelle [†]	70	12	39.7	2.05	Felton [†]	84	26	50.1	3.69	Oakdale a [†]	70	31	50.3	4.46
Brewton [†]	81	25	55.2	4.87	Craighead [†]	70	24	54.8	4.85	Craighead [†]	70	18	45.1	2.52	Fernando [†]	78	34	56.2	2.23	Oakdale b [†]	70	31	50.3	1.00					
Chepultepec	68 ^b	14 ^b	43.4 ^b	3.57	Conway [†]	65	20	44.4	0.75	Corning [†]	70	12	39.7	2.05	Florien [†]	68	28	45.8	1.75	Oakdale b [†]	70	31	50.3	1.52					
Citronelle [†]	72	27	55.4	2.50	Claiborne Landing [†]	1.70	....	....	Dardanelle [†]	70	12	39.7	2.05	Folsom City a [†]	72	35	50.8	2.53	Oakdale b [†]	68	26	50.1	2.63			
Cordova [†]	4.35	Clarendon [†]	Dardanelle [†]	70	12	39.7	2.05	Folsom City b [†]	68	32	49.7	2.50	Ogilby [†]	79	39	50.3	0.23					
Elba [†]	75	24	52.4	1.68	Elba [†]	70	18	47.0	2.49	Elba [†]	70	18	47.0	2.49	Fort Ross [†]	Oleta [†]	65	26	44.6	3.18					
Eufaula [†]	1.41	Fayetteville [†]	68	9	42.5	1.92	Fayetteville [†]	68	9	42.5	1.92	French Corral [†]	76	32	50.0	2.90	Ontario a [†]	82	35	50.1	3.69					
Florence a [†]	3.33	Fulton [†]	Fulton [†]	Fresno [†]	68	29	50.7	0.99	Ontario b [†]	85	31	51.1	3.05					
Florence b [†]	68	21	43.6	3.32	Gaines Landing [†]	Gaines Landing [†]	Galt [†]	67	30	52.5	1.50	Orangevale [†]	65	32	47.8	2.40					
Gadsden [†]	68	23	45.6	4.05	Hamburg [†]	74	19	48.0	2.72	Hamburg [†]	74	19	48.0	2.72	Hollister [†]	80	23	52.5	1.50	Orlando [†]	73	33	53.1	1.23					
Geneva [†]	86	22 ^a	54.0 ^a	2.42	Helena a [†]	Helena a [†]	Holmes [†]	74	35	50.7	1.49	Oroville a [†]	74	35	52.8	2.18					
Greensboro [†]	74	22	49.6	5.30	Hot Springs [†]	69	14	46.4	2.05	Hot Springs [†]	69	14	46.4	2.05	Hornbrook [†]	55	26	46.5	7.19	Oroville b [†]	75	30	52.0	2.20					
Healing Springs [†]	75	20	49.9	2.77	Hot Springs [†]	72	8	42.4	2.26	Hot Springs [†]	72	8	42.4	2.26	Julian [†]	73	26	42.5	2.74	Oroville b [†]	75	30	52.0	2.20					
Highland Home [†]	73	22	53.8	2.85	Hot Springs [†]	72	16	47.9	1.59	Hot Springs [†]	72	16	47.9	1.59	Kirby [†]	65	31	46.9	3.90	Oroville b [†]	75	30	52.0	2.20					
Livingston b [†]	6.02	Hot Springs [†]	72	20	45.0	2.14	Hot Springs [†]	72	20	45.0	2.14	Glendora [†]	Oroville b [†]	75	30	52.0	2.20					
Lynn a [†]	5.21	Hot Springs [†]	62	16	41.2	1.10	Hot Springs [†]	62	16	41.2	1.10	Glen Ellen [†]	78	30	49.6	5.26	Oroville b [†]	75	30	52.0	2.20					
Maple Grove	74	16	45.8	4.41	Hot Springs [†]	70 ^a	20 ^a	48.0 ^a	2.07	Hot Springs [†]	70 ^a	20 ^a	48.0 ^a	2.07	Gormans Station [†]	Oroville b [†]	75	30	52.0	2.20					
Marion [†]	4.34	Hot Springs [†]	Hot Springs [†]	Grass Valley [†]	Oroville b [†]	75	30	52.0	2.20					
Montevallo [†]	83	20	44.9	....	Hot Springs [†]	68	20	43.8	0.99	Hot Springs [†]	68	20	43.8	0.99	Galt [†]	67	30	52.5	1.50	Palermo [†]	70	28	47.4	1.76				
Mount Willing [†]	73	24	52.4	2.15	Hot Springs [†]	70	15	43.4	1.27	Hot Springs [†]	70	15	43.4	1.27	Georgetown [†]	70	26	46.5	7.19	Palm Springs [†]	84	38	58.7	0.11					
Newbern [†]	71	22	49.0	3.80	Hot Springs [†]	72	17	44.0	2.52	Hot Springs [†]	72	17	44.0	2.52	Georgetown [†]	70	26	46.5	7.19	Padasand [†]	81	34	54.2	4.08					
Newburg [†]	74	17	45.3	3.50	Hot Springs [†]	70	16	40.9	1.03	Hot Springs [†]	70	16	40.9	1.03	Georgetown [†]	72	26	46.5	7.19	Paso Robles [†]	71	25	47.8	2.38					
Newton [†]	75	23	48.8	4.25	Hot Springs [†]	70	16	40.9	1.03	Hot Springs [†]	70	16	40.9	1.03	Georgetown [†]	72	26	46.5	7.19	Petaluma [†]	81	30	50.7	3.54					
Okfuskee [†]	67	21	47.6	3.40	Hot Springs [†]	70	16	40.9	1.03	Hot Springs [†]	70	16	40.9	1.03	Georgetown [†]	72	26	46.5	7.19	Piedras Blancas LH	....	....	....	....	
Pushmataha [†]	73 ^b	27 ^b	51.9 ^b	4.12	Hot Springs [†]	70	16	40.9	1.03	Hot Springs [†]	70	16	40.9	1.03	Georgetown [†]	72	26	46.5	7.19	Pigeon Point L. H.	....	....	....	....	
Rock Mills [†]	3.24	Hot Springs [†]	68	15	40.9	1.03	Hot Springs [†]	68	15	40.9	1.03	Georgetown [†]	72	26	46.5	7.19	Point Mugu L. H.	....	....	....	....	
Scottsboro [†]	77	19	43.8	3.27	Hot Springs [†]	70	16	40.9	1.03	Hot Springs [†]	70	16	40.9	1.03	Georgetown [†]	72	26	46.5	7.19	Point Mugu L. H.	....	....	....	....	
Seimla [†]	3.27	Hot Springs [†]	70	16	40.9	1.03	Hot Springs [†]	70	16	40.9	1.03	Georgetown [†]	72	26	46.5	7.19	Point Mugu L. H.	....	....	....	....	
Starlington [†]	73	24	51.5	0.90	Hot Springs [†]	70	16	40.9	1.03	Hot Springs [†]	70	16	40.9	1.03	Georgetown [†]	72	26	46.5	7.19	Point Mugu L. H.	....	....	....	....	
Sturdevant [†]	1.12	Hot Springs [†]	70	16	40.9	1.03	Hot Springs [†]	70	16	40.9	1.03	Georgetown [†]	72	26	46.5	7.19	Point Mugu L. H.	....	....	....	....	
Talladega [†]	3.86	Hot Springs [†]	70	16	40.9	1.03	Hot Springs [†]	70	16	40.9	1.03	Georgetown [†]	72	26	46.5	7.19	Point Mugu L. H.	....	....	....	....	
Talladega b [†]	68	19	45.8	3.55	Hot Springs [†]	70	16	40.9	1.03	Hot Springs [†]	70	16	40.9	1.03	Georgetown [†]	72	26	46.5	7.19	Point Mugu L. H.	....	....	....	....	
Tallassee [†]	3.55	Hot Springs [†]	70	16	40.9	1.03	Hot Springs [†]	70	16	40.9	1.03	Georgetown [†]	72	26	46.5	7.19	Point Mugu L. H.	....	....	....	....	
Tallassee [†]	3.55	Hot Springs [†]	70	16	40.9	1.03	Hot Springs [†]	70	16	40.9	1.03	Georgetown [†]	72	26	46.5	7.19	Point Mugu L. H.	....	....	....	....	
Tallassee [†]	3.55	Hot Springs [†]	70	16	40.9	1.0																				

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
California—Cont'd.	0	0	0	Ins.	Colorado—Cont'd.	0	0	0	Ins.
Susanville [†]	58	20	37.5	0.95	Sunnyside	50	5	25.0	2.41
Sutter Creek [†]	60	24	41.2	3.60	Surface Creek [†]	58	6	32.8	1.17
Tehachapi ^a [†]	62	27	40.1	5.25	Thorn [†]	60	0	32.7	0.18
Tehachapi ^b	71	10	41.9	3.09	T. S. Ranch [†]	54	12 ¹	34.8	1.20
Tehama ^a ^b	82	35	59.2	1.65	Twin Lakes	4.20
Templeton [†]	72	28	48.2	2.29	Villas	0.06
Towles [†]	71	25	44.9	6.78	Wallet [†]	0.30
Tracy [†]	68	32	49.0	0.87	Ward District	0.11
Traver [†]	65	40	50.0	1.41	Watkins [†]	60	16	37.1	1.00
Trinidad L. H.	6.52	Yuma	0.55
Tropic [†]	86	36	55.1	4.19	Zuck	0.70
Truckee [†]	58	0	28.5	2.82	Connecticut.
Tulare ^a ^b	64	32	47.3	1.05	Bridgeport [†]	54	10	31.4	4.05
Tulare ^c	Canton	54	5	27.6	4.46
Tulare ^c	80	28	50.7	1.07	Colchester	60	2	31.0	3.09
Tunnel No. 2	3.96	Falton Village	4.16
Turlock ^a ^b	70	32	52.2	1.50	Greenfield Hill	3.65
Turlock ^b [†]	64	26	40.6	1.36	Hartford ^b	4.73
Ukiah [†]	68	26	46.0	3.05	Hartford ^c	53	3	28.8	1.66
Upper Mattole [†]	76	36	49.0	9.57	Lake Konomoc	4.66
Vacaville ^a [†]	80	32	51.1	2.55	Lebanon	3.93
Vacaville ^b [†]	80	32	51.8	1.35	Middletown	58	0	29.0	4.15
Valley Springs [†]	72	33	49.6	2.08	New Hartford ^a [†]	52	4	26.2	4.04
Ventura [†]	85	36	57.1	3.04	New Hartford ^b	5.20
Vina [†]	79	38	50.9	2.15	N. Grosvenor Dale	54	2	29.7	3.50
Volcano Springs [†]	85	35	59.7	0.00	Norwalk ^b	56	5	31.0	3.79
Walnut Creek	72	31	50.4	1.72	Southington [†]	56	2	29.2	3.90
Wenrich Ranch	2.00	South Manchester	3.60
West Butte [†]	65	32	1.62	Stevenson	2.30
Westley [†]	68	36	51.6	1.00	Storrs [†]	56	2	27.8	3.68
Wheatland	70	30	47.8	1.85	Thompson [†]	52	3	27.3	1.00
Whittier [†]	84	38	60.6	2.30	Voluntown [†]	53	2	30.4	5.01
Williams ^a ^b	80	32	50.6	0.63	Wallingford [†]	56	3	38.2	1.25
Willows ^a [†]	78	29	46.8	0.92	Waterbury	59	5	31.0	4.08
Willows ^b [†]	75	31	51.4	0.98	West Simsbury	3.99
Winchester [†]	84	30	53.2	3.08	Delaware.
Winters [†]	79	34	53.2	2.02	Dover [†]	66	17	37.8	2.77
Wire Bridge [†]	66	29	47.8	3.43	Kirkwood [†]	62	33.0
Woodland [†]	72	31	50.5	1.80	Millford	66	17	30.6	2.72
Yerba Buena L. H.	1.33	Seaford [†]	66	15	37.2	3.09
Yreka [†]	55	20	36.8	2.11	District of Columbia.
Yuba City ^a ^b	64	35	53.8	2.19	Dist'g Reserv'r [†]	61	12	37.5	2.04
Colorado.	.....	.....	.....	Rec'g Reserv'r [†]	59	11	37.8	2.28
Abbott	.....	.....	0.30	West Washington	69	10	39.2	2.34
Akron [†]	73	6	28.3	0.56	Florida.
Alma [†]	40	4	20.0	1.12	Amelia [†]	75	36	57.6	4.80
Amherst [†]	0.28	Archer [†]	84	31	60.2	4.20	
Arboles	.....	.....	0.80	Brooksville [†]	80	35	58.9	2.29
Avoca	.....	.....	0.48	Clermont [†]	82	40	61.6	5.53
Boulder [†]	63	11	38.4	De Land	80	29	60.0	4.57	
Breckenridge [†]	52	15	19.8	Eustis [†]	82	36	59.9	4.03	
Brush [†]	57	0	29.4	Federal Point	80	33	59.3	2.68	
Byers [†]	49	10	26.2	Fort Meade [†]	81	26	60.7	3.07	
Canyon [†]	93	8	39.2	Grasmere [†]	81	36	62.8	3.33	
Castle Rock [†]	62	1	34.0	Green Cove Spgs [†]	79	34	58.0	4.18	
Cheyenne Wells [†]	62	10	32.2	Homeland [†]	83	39	60.4	1.66	
Climax [†]	36	5	13.8	Kissiminee [†]	85	35	65.4	1.56	
Coilbran	.....	.....	2.15	Lake City [†]	78	25	61.0	6.96
Como (near) [†]	41	7	21.6	Manatee [†]	75	36	57.6	4.80	
Cope [†]	58	9	35.8	Meritts Island [†]	79	43	65.5	2.42	
Deer Trail [†]	58	10	33.9	Moseley Hall [†]	74	30	57.2	5.86	
Delta [†]	58	5	32.2	Mullet Key [†]	76	41	61.0	2.20	
Divide Ex. Station	56	4	30.2	Myers [†]	83	30	65.5	1.69	
Downing [†]	70	2	37.0	New Smyrna [†]	80	31	61.6	2.30	
Dumont	48	10	31.0	Ocala [†]	80	32	59.5	2.23	
First View [†]	62	11	35.2	Oorang City [†]	83	29	60.9	3.23	
Fort Collins [†]	60	2	34.0	Orlando [†]	82	34	63.8	1.89	
Garnett	.....	.....	0.00	Oxford [†]	79	34	60.3	3.01
Glen Eyrie [†]	58	5	34.6	Plant City [†]	84	29	61.5	1.56	
Glenwood Spgs [†]	55	12	32.8	Portland [†]	74	30	57.2	5.86	
Gold Hill [†]	58	14	32.0	Quincy [†]	77	24	54.5	4.53	
Grand Junction [†]	53	2	32.2	Rainbow [†]	75	24	52.7	4.56	
Greeley [†]	58	11	33.4	Rancho Cucamonga [†]	76	24	53.5	4.56	
Gunnison [†]	45 ⁴	18 ⁴	16.6	Red Bluff [†]	77	25	54.0	4.56	
Hugo [†]	60	10	31.7	Redwood City [†]	78	25	53.5	4.56	
Hugo (near) [†]	62	1	31.2	Reedley [†]	73	27	50.0	2.36	
Husted [†]	64	3	34.6	Reedville [†]	70	25	49.3	4.48	
Idaho Springs [†]	53	2	32.2	Richland [†]	74	27	54.4	4.46	
Julesburg [†]	64	2	30.8	Riverton [†]	75	24	52.7	4.46	
Kit Carson [†]	68	20	38.6	Riverton [†]	76	24	52.7	4.46	
La Jara [†]	62 ⁴	4 ⁴	29.4 ⁴	Riverton [†]	77	24	52.7	4.46	
Lamar [†]	67	8	36.8	Riverton [†]	78	24	52.7	4.46	
La Porte	.....	.....	0.20	Riverton [†]	79	24	52.7	4.46
Las Animas [†]	68	1	32.6	Riverton [†]	80	24	52.7	4.46	
Lavender [†]	56	0	25.8	Riverton [†]	81	24	52.7	4.46	
Lay [†]	50	0	26.8	Riverton [†]	82	24	52.7	4.46	
Le Roy [†]	58 ⁸	8	32.2	Riverton [†]	83	24	52.7	4.46	
Leilei	.....	.....	0.40	Riverton [†]	84	24	52.7	4.46
Loveland	.....	.....	0.30	Riverton [†]	85	24	52.7	4.46
Minneapolis [†]	73	9	39.2	Riverton [†]	86	24	52.7	4.46	
Monte Vista [†]	53	0	25.5	Riverton [†]	87	24	52.7	4.46	
Moraine [†]	48	0	26.7	Riverton [†]	88	24	52.7	4.46	
Pagoda (near) [†]	49	3	25.9	Riverton [†]	89	24	52.7	4.46	
Paonia [†]	51	1	20.0	Riverton [†]	90	24	52.7	4.46	
Red Cliff	.....	.....	0.45	Riverton [†]	91	24	52.7	4.46
Rico	.....	.....	1.53	Riverton [†]	92	24	52.7	4.46
River Bend [†]	60	10	1.20	Riverton [†]	93	24	52.7	4.46	
Rocky Ford [†]	66	7	34.6	Riverton [†]	94	24	52.7	4.46	
Saint Cloud	.....	.....	0.25	Riverton [†]	95	24	52.7	4.46
San Luis [†]	56	5	27.2	Riverton [†]	96	24	52.7	4.46	
Scissors [†]	51	0	21.0	Riverton [†]	97	24	52.7	4.46	
Seibert [†]	52	0	26.0	Riverton [†]	98	24	52.7	4.46	
Smoky Hill Mine [†]	62	1	33.4	Riverton [†]	99	24	52.7	4.46	
Stamford [†]	60	6	20.8	Riverton [†]	100	24	52.7	4.46	
Steamboat Spring [†]	49	10	24.2	Riverton [†]	101	24	52.7	4.46	

Meteorological record of voluntary

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature, (Fahrenheit.)			Precip'n.	Stations.	Temperature, (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
Esca—Cont'd.	0	0	0	Ins.	Louisiana.	0	0	0	Ins.
Williams *1.	51	-20	18.5	0.96	Abbeville	88	27	59.0	2.40
Winterste *1.	53	-9	25.0	1.25	Alexandria ¹	70	20	49.0	6.05
Kansas.					Amitie ¹	78	23	57.6	3.58
Abilene ¹	68	4	36.6	0.62	Bastrop ¹	77	23	52.5	2.69
Achilles ¹	65	5	35.8	0.94	Baton Rouge ¹	74 ⁸	27	53.8	3.77
Allison ¹	65	7	39.2	0.94	Calhoun ¹	73	23	50.5	2.34
Altoona ¹	67	9	36.2	0.29	Cameron ¹	87	31	60.5	3.26
Atchison ¹	66	1	33.2	0.32	Cheneyette ¹	22	.....	6.16	.....
Beloit ¹	70	5	37.0	0.28	Clinton ¹	83	.....	3.66	.....
Bucklin.					Coushatta ¹	.....	4.70	.....
Cawker City ¹	70	6	36.7	0.10	Coughatty ¹	78	21	51.8	6.41
Colby ¹	68	-1	34.4	0.05	Covington ¹	74 ⁸	20 ⁸	46.5 ⁸	3.84
Coldwater ¹	67	8	35.9	0.30	Davis.	4.07	.....	4.07	.....
Collyer ¹	70	10	34.5	0.00	Donaldsonville ¹	80	30	57.0	2.84
Columbus ¹	68	9	39.0	0.93	Emilie ¹	77	28	55.8	3.36
Cunningham ¹	68	7	37.0	0.31	Farmerville.	77	23	49.4	2.26
Downs.					Franklin ¹	77	26	57.8	1.69
Eldorado ¹	73	-8	35.7	0.60	Girard ¹	75	21	47.4	3.75
Elk City ¹	68	11	40.6	0.70	Grand Coteau ¹	77	30	55.9	4.70
Ellis ¹	66	10	38.9	0.71	Hamburg ¹	.....	.....	5.99	.....
Emporia ¹	68	5	37.9	0.13	Hammond ¹	78	24	55.0	2.60
Englewood ¹	75	13	41.2	0.13	Honma ¹	80	26	60.0	0.06
Eureka Ranch ¹	67	5	35.4	0.25	Jeanerette ¹	82	26	58.0	2.00
Fort Riley ¹	69	.....	1.00	Lafayette ¹	82	26	58.6	3.43	
Garden City ¹	71	8	36.2	T.	Lake Charles ¹	73	33	52.2	4.20
Gibson ¹	65	2	33.3	0.58	Lake Providence ¹	73	22	49.1	3.37
Gove ¹	66	10	34.2	0.21	Maurpas.	80	24	56.0	3.44
Grainfield ¹	70	12	41.1	0.20	Melville ¹	79	32	61.6	2.53
Grenola ¹	70	10	40.0	0.30	Minden ¹	77	22	53.6	2.31
Grinnell ¹	68	4	33.0	T.	Monroe ¹	73	25	52.2	3.21
Halstead.	64	6	35.0	0.59	Natchitoches ¹	80	24	52.7	2.61
Hayes City ¹	71	0	36.4	0.20	New Iberia ¹	77	29	59.7	2.60
Horton ¹	64	2	33.1	1.33	Opelousas ¹	85	27	60.1	6.84
Hutchinson ¹	72	8	41.2	1.01	Oxford.	82	20	51.6	3.50
Independence ¹	69	9	39.6	0.49	Paincourtville ¹	81 ⁸	27 ⁸	56.2 ⁸	1.91
Kiowa ¹	75	11	41.3	0.30	Rainey ¹	80	24	55.8	3.02
Lawrence ¹	68	5	35.3	0.53	Roseland.	79	23	55.4	4.69
Lebo ¹	69	4	37.3	0.24	Schriever ¹	80	.....	1.94	.....
Leoti ¹	67	5	35.7	0.22	Shell Beach.	74	30	59.2	3.28
Mackayville ¹	68	5	38.2	0.31	Sugar Ex. Station ¹	75	39	55.2	2.85
McPherson ¹	66	7	38.1	0.14	Manhattan ¹	64	4	34.2	0.70
Matthews ¹	68	4	31.8	0.37	Thibodeaux.	.....	.....	1.26	.....
Mankato ¹	62	4	31.8	0.20	Wallace.	80	30	56.9	4.10
Marion ¹	66	4	32.6	0.20	Winnfield ¹	77	23	53.4	3.84
Marmaton.	5	3	6	0.45					
Medicine Lodge ¹	.....	.....	0.38						
Minneapolis ¹	66	4	35.4	0.28					
Monument ¹	66	5	35.4	0.00					
Morland.	70	0	35.6	0.20					
Morton ¹	72	10	39.1	0.30					
Mount Hope ¹	69	10	39.1	0.48					
Norton ¹	66	5	32.9	0.38					
Oberlin ¹	55	0	50	0.50					
Olathe ¹	66	3	35.4	0.41					
Oswego ¹	72	2	37.2	0.28					
Pantlind.	69	8	37.9	0.26					
Phillipsburg ¹	66	3	26.6	0.36					
Pleasant Dale ¹	70	5	37.0	0.12					
Quinter ¹	64	12	38.1	T.					
Rome ¹	70	10	40.4	0.34					
Sedan ¹	69	9	40.4	0.16					
Sharon Springs ¹	70	12	36.7	0.00					
Sterling ¹	66	8	40.1	0.05					
Tribune ¹	66	7	35.4	0.50					
Wa Keeney ¹	64	12	35.4	0.40					
Wakefield ¹	66	6	36.7	0.88					
Wallace ¹	.....	.....	0.10						
Wallace ¹	68	20	44.1	0.05					
Wamego ¹	65	5	34.0	0.60					
Washington ¹	65	3	30.0	0.38					
Winona ¹	62	10	33.6	T.					
Yates Center ¹	67	.....	0.23						
Kentucky.									
Alpha ¹	67	19	44.1	1.30					
Bowling Green ¹	68	14	37.9	2.79					
Burnside ¹	.....	.....	3.01						
Canton ¹	70	15	40.6	0.00					
Carrollton ¹	68	17	38.0	3.04					
Catlettsburg ¹	65	14	39.2	1.95					
Earlington ¹	72	18	43.0	1.75					
Eddyville ¹	.....	.....	2.90						
Edmonton ¹	65	15	39.4	3.42					
Elizabethtown ¹	67	15	36.9	1.68					
Eubank ¹	67	10	36.6	3.11					
Falmouth ¹	.....	.....	1.99						
Fords Ferry ¹	71	12	40.3	1.22					
Franklin ¹	68	18	41.4	4.99					
Greendale ¹	67	12	36.2	2.53					
Greensburg ¹	69	18	36.2	3.47					
Harrodsburg ¹	71	12	37.8	2.52					
Hendricks.	.....	.....	2.85						
Louis ¹	66	15	36.4	2.78					
Middleboro ¹	.....	.....	2.67						
Mount Sterling ¹	63	18	37.2	2.31					
Munfordville ¹	67	18	40.0	1.93					
Paducah ¹	78	13	41.0	2.06					
Paducah ¹	68	13	38.8	2.19					
Pelville ¹	68	13	38.8	2.19					
Princeton ¹	69	13	38.1	3.65					
Russellville ¹	71	14	39.8	2.91					
Sandy Hook ¹	67	16	38.2	2.52					
Shelby City ¹	67	16	36.2	2.73					
Shelbyville ¹	68	12	37.3	2.96					
South Fork ¹	.....	35.6	3.13						

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature, (Fahrenheit.)			Precip'n.	Stations.	Temperature, (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
Louisiana.	0	0	0	Ins.	Massachusetts—Con.	0	0	0	Ins.
Abbeville	88	27	59.0	2.40	East Templeton ¹	50	-8	24.4	4.48
Alexandria ¹	70	20	49.0	6.05	Egg Rock, Nahant.	52	-2	30.9	6.77
Amitie ¹	78	23	57.6	3.58	Final River ¹	57	0	6.77	6.77
Bastrop ¹	77	23	52.5	2.69	Fiskdale.	.....	.....	3.95	.....
Baton Rouge <sup									

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
Mississippi—Cont'd.	68	60	64	Ins.	Missouri—Cont'd.	68	60	64	Ins.
Fayette [†]	74	66	54.7	6.52	Stellada [†]	67	—1	38.4	0.22
French Camps [†]	71	79	54.8	4.36	Unionville [†]	63	—7	26.2	0.63
Greenville [†]	69	22	47.8	1.87	Vancleave	—	—	—	0.23
Hattiesburg [†]	78	26	54.9	3.51	Vermont [†]	68	6	35.5	0.31
Hernando [†]	70	25	47.6	2.10	Vilas	—	—	—	0.64
Jackson [†]	75	24	51.8	3.28	Virgil City	—	—	—	0.35
Kosciusko [†]	74	21	49.2	3.40	Warrensburg	—	—	—	0.13
Lake [†]	—	—	—	—	Warrenton	67	3	34.0	1.14
Logtown [†]	73	26	54.6	2.09	Wheatland	—	—	—	0.90
Louisville [†]	75	18	48.4	5.15	Montana	—	—	—	—
McComb [†]	76	27	53.0 ⁰	5.55	Boulder [†]	48	1	28.6	0.45
Macon [†]	73	20	48.6	5.78	Choteau [†]	56	—15	30.0	1.00
Okolona [†]	—	—	—	—	Cokedale [†]	43	—	27.8	4.09
Palo Alto [†]	72	22	46.2	4.20	Deer Lodge City [†]	48	—11	27.4	0.03
Pontotoc [†]	70	25	46.0	3.93	Elk Park [†]	45	—27	21.7	0.03
Port Gibson [†]	79	20	50.1	5.52	Fort Custer [†]	52	—8	31.0	0.26
Stonington [†]	76	28	53.9	—	Fort Keogh	48	—21	19.4	0.82
Topton [†]	72	26	47.9	4.55	Fort Logan	58	—5	28.3	0.37
University [†]	72	27	48.0	1.40	Fort Missoula	53	—5	27.6	0.37
Vaiden [†]	77	19	47.0	4.66	Glasgow [†]	46	—29	14.2	—
Water Valley [†]	74	25	46.3	1.69	Glendive [†]	45	—22	18.8	0.75
Waynesboro [†]	76	22	48.4	3.15	Great Falls [†]	54	—12	29.2	0.38
Yazoo City [†]	77	23	52.2	4.19	Hogan [†]	53	—14	31.3	0.50
Missouri	—	—	—	—	Martinsdale [†]	49	—9	28.5	0.90
Akron	—	—	—	—	Mingusville	59	—33	20.2	T.
Appleton City [†]	69	6	37.4	0.60	Musselshell [†]	56	—5	30.3	0.75
Arlington [†]	—	—	—	—	Powder River [†]	47	—21	23.0	0.95
Arthur [†]	6	32.4	32.0	0.95	Virginia City [†]	44	4	27.6	0.60
Bethany	63	—3	27.7	1.06	Nebraska	—	—	—	—
Big Piney	—	—	—	—	Agee [†]	60	—11	21.7	0.56
Birch Tree	68	12	39.0	1.74	Arberville [†]	54	1	30.9	0.97
Bluffton [†]	70	6	35.8	0.70	Ashland [†]	61	—4	26.3	0.65
Boonville [†]	—	—	—	—	Ashton [†]	62 ⁰	—4	25.7 ⁰	0.93
Brunswick	66	0	33.8	3.85	Bassett [†]	55	—10	24.2	1.30
Cape Girardeau [†]	—	—	—	—	Beatrice [†]	63	1	32.2	0.41
Carrollton [†]	66	4	34.6	0.36	Bever City	66	—1	32.9	0.52
Conception	60	0	27.5	0.73	Bratton [†]	63	0	30.5	0.47
Darksville [†]	68	4	36.4	0.75	Burwell [†]	46	—2	23.0	0.22
Downing	—	—	—	—	Callaway [†]	63	—6	27.6	0.79
East Lynne [†]	4	31.4	29	—	Colombus [†]	47	—5	23.1	1.35
Edge Hill [†]	3	40.2	0.97	—	—	—	—	—	
Eight Mile [†]	66	4	32.2	0.21	Cornelia	—	—	—	—
Eldon [†]	70	4	38.0	0.93	Crete	62	—2	25.9	0.47
Emma [†]	8	34.8	0.20	Culbertson [†]	—	—	—	—	
Fairport	—	—	—	—	David City [†]	52	—8	24.1	1.05
Farmersville	—	—	—	—	Ericson [†]	56	—10	35.0	0.50
Fayette	71	1	34.8	0.64	Ewing [†]	—	—	—	—
Fox Creek [†]	70	4	36.2	1.53	Fairbury [†]	63	7	35.6	0.90
Fulton	—	—	—	—	Fort Robinson	62	—5	30.4	1.05
Gallatin [†]	64	—2	32.8	1.84	Fort Sidney	60	—2	29.2	0.65
Gayoso [†]	16	40.6	2.61	—	—	—	—	—	
Glasgow [†]	68	2	35.0	0.30	Franklin [†]	64	5	32.5	0.75
Gordonville [†]	13	37.2	2.17	Geneva [†]	64	4	30.8	1.01	
Gorin [†]	—1	31	28.8	0.60	Genoa [†]	48	—8	25.8	0.04
Grove Dale	75	—5	39.5	1.36	Gering [†]	63 ⁰	—6 ⁰	31.3 ⁰	1.33
Half Way	—	—	—	—	Glenwood [†]	50	—4	20.8	0.94
Harrisonville [†]	68	4	33.4	0.29	Hightower [†]	42	10	24.6	T.
Hastain	68	3	36.4	0.77	Hartington [†]	48	—13	19.2	2.35
Hermann [†]	—	—	—	—	Harvard [†]	57	2	28.3	0.98
Houston	65	0	39.2	0.51	Hay Springs [†]	59	—4	27.4	1.16
Ironton [†]	69	5	37.7	1.02	Hebron [†]	66	2	32.3	0.42
Jefferson City [†]	69	6	35.0	0.47	Heldrege [†]	—	4	28.5	0.91
Kidder	65	—1	31	0.70	Imperial [†]	62	6	31.8	0.70
Lamar [†]	67	9	39.8	0.46	Indianola [†]	65	7	33.2	0.30
Lamotte [†]	—	—	—	—	Kennedy [†]	55	5	29.4	0.73
La Plata [†]	64	0	30.4	0.91	—	—	—	—	
Lebanon	—	—	—	—	Kimball [†]	59	3	32.6	0.85
Lexington [†]	69	2	30.1	1.25	Lincoln [†]	75	4	34.0	1.33
Liberty	67	5	34.7	0.79	Madrid [†]	55	—15	20.9	0.72
Linn Creek	75	0	36.8	0.80	Marquette [†]	52	—3	—	1.13
Louisiana Bridge	—	—	—	—	Minden [†]	56	3	29.7	1.60
McCune [†]	68	—2	32.2	0.33	Neasbit [†]	59	—4	26.6	0.46
Marceline	—	—	—	—	Norfolk [†]	48	—10	22.7	1.71
Marshall [†]	—	—	—	—	North Loup [†]	60	2	25.0	1.17
Mine La Motte [†]	69	0	33.8	0.25	North Platte [†]	60	1	31.7	0.05
Mount Vernon	67	6	35.4	1.00	North Platte [†]	60	2	35.0	0.05
Neosho	70	14	45.5	0.50	North Loup [†]	60	2	35.0	0.05
New Boston	69	40	4.0	1.05	North Platte [†]	60	—10	22.6	0.53
New Hartford [†]	64	2	39.8	T.	North Platte [†]	60	—10	22.6	0.53
New Haven [†]	70	—4	34.0	0.53	North Platte [†]	60	—10	22.6	0.53
New Madrid	67	69	37.4	1.15	North Platte [†]	60	—10	22.6	0.53
New Palestine	—	—	—	—	North Platte [†]	60	—10	22.6	0.53
Oakfield [†]	67	2	36.5	1.03	North Platte [†]	60	—10	22.6	0.53
Oak Ridge [†]	14	38.2	1.71	North Platte [†]	60	—10	22.6	0.53	
Olden [†]	67	8	40.7	1.66	North Platte [†]	60	—10	22.6	0.53
Oregon [†]	65	0	31.8	0.87	North Platte [†]	60	—10	22.6	0.53
Oregon [†]	63	2	31.7	0.95	North Platte [†]	60	—10	22.6	0.53
Otoe	—	—	—	—	North Platte [†]	60	—10	22.6	0.53
Palmyra	—	—	—	—	North Platte [†]	60	—10	22.6	0.53
Panacea	66	4	39.2	1.92	North Platte [†]	60	—10	22.6	0.53
Phillipsburg [†]	68	6	37.0	0.50	North Platte [†]	60	—10	22.6	0.53
Pickering [†]	—2	28.6	1.20	North Platte [†]	60	—10	22.6	0.53	
Platte River [†]	64	6	31.4	0.59	North Platte [†]	60	—10	22.6	0.53
Potosi	67	4	35.7	1.18	North Platte [†]	60	—10	22.6	0.53
Princeton [†]	64	—2	32.1	1.27	North Platte [†]	60	—10	22.6	0.53
Rolla [†]	—	—	—	—	North Platte [†]	60	—10	22.6	0.53
Round Springs	—	—	—	—	North Platte [†]	60	—10	22.6	0.53
Saint Charles ^b	68	2	35.8	0.89	North Platte [†]	60	—10	22.6	0.53
Saint Joseph [†]	—	—	—	—	North Platte [†]	60	—10	22.6	0.53
Saint Louis ^a	68	3	36.0	1.29	North Platte [†]	60	—10	22.6	0.53
Sarcocie [†]	70	12	42.4	1.11	North Platte [†]	60	—10	22.6	0.53
Sedalia	68	2	35.2	0.87	North Platte [†]	60	—10	22.6	0.53
Shelbina	—	—	—	—	North Platte [†]	60	—10	22.6	

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
N. Carolina—Cont'd.	•	0	0	Ins.	Ohio—Cont'd.	•	0	0	Ins.
Auburn ¹	70	23	44.7	4.01	Hedges	67	2	28.0	2.25
Bailey ¹	70	20	43.5	1.29	Hillhouse	65	7	30.1	3.70
Bakersville ¹	70	10	38.3	1.95	Hillsboro	68	11	35.8	2.54
Blowing Rock ¹	60	12	37.2	1.80	Hiram ¹	62	2	29.6	3.57
Bryson City ¹	—	—	—	—	Jacksonboro ¹	68	11	32.4	1.75
Chapel Hill ¹	72	19	43.4	3.45	Kenton ¹	66	8	31.8	2.22
Columbus	68	19	44.5	2.50	Kilbourne	64	7	32.6	2.26
Currituck Inlet	—	—	—	—	Killbuck	63	4	31.3	3.09
Experiment Farm	73 ²	23 ²	45.4 ²	4.01	Levering	63	1	30.4	2.52
Falkland ¹	73	20	45.5	3.00	Logan ¹	67	10	35.5	2.70
Fayetteville ¹	—	—	—	—	Lordstown ¹	62	4	30.9	3.24
Flat Rock	66	13	39.5	2.22	Lowell	67	15	36.4	2.04
Greenville ¹	—	—	—	—	McConnelleville ¹	66	11	34.5	2.73
Henderson ¹	73	18	42.6	4.18	Manchester	62	18	35.8	3.16
Highlands ¹	59	12	36.6	3.16	Mansfield ¹	—	—	—	—
Horse Cove ¹	63	13	41.3	3.47	Marietta a ¹	—	—	—	—
Lenoir ¹	63	19	39.9	1.20	Marietta b ¹	65	18	38.1	2.72
Lowiston	—	—	—	—	Marietta ¹	65	5	30.4	2.58
Lillington ¹	—	—	—	—	Marietta ¹	65	18	38.1	2.72
Littleton ¹	74	20	42.8	3.02	Marietta ¹	65	5	30.4	2.58
Louisburg ¹	70	19	42.8	3.80	Millford	63	5	34.4	2.18
Lynn ¹	71	—	36.6	1.71	Milligan	66	5	34.4	2.84
Marion	71	17	39.8	1.74	Millport	—	—	—	—
Napoleon ¹	63	22	40.9	5.25	Montpelier ¹	63	—2	27.8	4.38
Mocksville ¹	67	20	45.4	0.79	Mountaineer	66	10	36.4	2.53
Morganton ¹	70	17	41.9	1.90	Neasboro ¹	60	11	35.0	3.78
Mount Airy ¹	68 ²	13 ²	39.0 ²	1.44	New Alexandria ¹	60	11	35.0	3.78
Mount Pleasant ¹	70	19	44.1	1.90	New Berlin	61	2	30.2	3.49
Murphy ¹	—	—	—	—	New Comerstown ¹	63	5	32.9	2.33
Newbern ¹	70	24	46.6	4.53	New Holland	65	8	33.8	2.35
Oak Ridge ¹	65	21	41.7	1.60	New Paris ¹	63	11	32.2	2.03
Pittsboro	67	17	41.4	3.40	North Lowisburg ¹	64	8	32.7	3.00
Raleigh ¹	70 ²	23 ²	44.8 ²	4.35	North Royalton	62	0	28.6	3.14
Rockingham ¹	73	20	44.3	4.61	Northwood ¹	70	8	32.4	1.70
Roxboro ¹	67	18	43.4	3.55	Oberlin	64	4	30.8	1.03
Rutherford Co. ¹	60	16	37.1	1.31	Orion ¹	69	10	33.3	2.43
Salisbury ¹	64	28	44.8	1.96	Orangeville	62	0	29.7	3.15
Salisbury ¹	—	—	—	—	Pataskala	64	6	31.1	3.55
Salsburg ¹	—	—	—	—	Plattsmouth	63	9	32.7	1.93
Saxon ¹	68	14	41.0	1.30	Pomeroy	67	10	36.4	1.17
Shebly ¹	66	18	41.4	2.91	Portsmouth a ¹	—	—	—	—
Sloan ¹	74	23	49.4	4.64	Portsmouth b ¹	72	18	36.5	2.05
Smithfield ¹	73	21	44.6	3.55	Potomac	—	—	—	—
Soapstone Mt. ¹	69	9	42.7	2.74	Prairie ¹	65	2	32.9	2.34
Southern Pines ¹	75	23	45.9	5.84	Preston ¹	65	15	36.8	2.34
Tarboro	76	19	40.2	4.10	Ridg'vle Corners	65	—2	29.2	3.24
Washington ¹	76	20	49.4	5.88	Rittman	62	3	29.8	2.38
Weldon ¹	73	18	44.0	5.41	Rush Creek	—	—	—	—
Willeyton ¹	74	20	45.0	2.87	Rutherford ¹	—	—	—	—
North Dakota.									
Fargo ¹	37	—34	1.8	0.35	Springboro	—	—	—	—
Fort Yates ¹	45	—29	12.0	1.01	Spring Valley	68	6	32.5	2.11
Grand Forks ¹	47	—28	1.1	0.89	Stoutsburg	—	—	—	—
Ohio.									
Akron ¹	63	9	36.8	2.75	Sylvania	64	0	28.9	3.14
Annapois ¹	62	7	34.4	2.96	Thurman	67	12	35.2	2.80
Arcanum	—	—	—	—	Tiffin ¹	63	10	31.2	2.01
Ashland ¹	62	9	31.0	2.52	Upper Sandusky ¹	62	9	32.2	1.61
Athens ¹	66 ²	12 ²	35.6 ²	2.46	Vane	66	15	32.9	2.09
Auburn	61	—4	37.6	3.76	Vermillion	64	4	30.8	2.05
Bangorville ¹	64	2	30.2	2.77	Vickery ¹	66	5	30.5	2.93
Batavia	—	—	—	—	Walnut ¹	—	—	—	—
Bement ¹	63	2	28.1	3.37	Wauseon ¹	64	5	31.2	2.46
Benton Ridge	66	—1	30.8	2.46	Waverly ¹	68	12	36.2	1.95
Bethany	65	13	33.0	2.67	Wayneaville ¹	68	12	36.2	1.95
Big Prairie	64	4	31.0	2.53	Wellington	67	11	33.5	2.37
Binola	—	—	—	—	Westerville ¹	67	11	33.5	2.35
Bisells	61	0	31.4	3.78	Weymouth ¹	64	0	29.8	2.50
Bladensburg	64	0	31.8	4.08	Wheeler ¹	64	5	31.2	3.37
Bloomington ¹	66	13	33.4	2.64	Winton ¹	66	5	31.2	2.52
Bowling Green ¹	66	—2	28.2	3.36	Wooler ¹	62	6	30.8	2.07
Bucyrus ¹	66	3	31.1	2.90	Youngstown ¹	60	4	30.9	1.80
Caledonia ¹	—	—	—	—	Zanesville ¹	60	4	30.9	1.80
Cambridge ¹	63	9	33.1	3.32	Oklahoma Ter.	—	—	—	—
Canal Dover ¹	68	3	31.4	2.23	Anadarko ¹	78	13	45.3	1.54
Canton ¹	62	9	32.2	2.73	Burnett ¹	73	12	45.2	1.77
Cardington	60 ²	3 ²	25.3 ²	2.15	Fort Reno ¹	72	11	43.2	1.46
Carrollton	63	5	33.4	3.13	Fort Sill	74	15	44.2	2.77
Celina ¹	66	11	35.7	2.05	Fort Supply	67	13	37.7	0.50
Cherry Fork	65	9	35.5	1.95	Keokuk Falls ¹	68	7	45.2	0.80
Chicago	69	0	27.0	0.99	Mangum ¹	80	13	45.0	0.67
Circleville ¹	—	—	—	—	Ponca ¹	68 ²	12 ²	43.8 ²	0.95
Clarksville ¹	64	11	34.3	2.87	Winnview ¹	70	12	44.2	1.80
Cleveland ¹	64	9	32.6	3.00	Oregon.	—	—	—	—
Coatlon	67	10	36.4	1.92	Albany a ¹	58	31	43.4	4.46
Colebrook	—	—	—	Albany b ¹	60	32	45.9	5.15	
Dayton a ¹	65	14	35.6	2.17	Arlington ¹	60	25	41.2	0.48
Dayton b ¹	—	—	—	Ashtabula ¹	52	20	35.2	3.15	
Demos	61	15	35.6	1.94	Benton ¹	55	—1	27.6	4.08
Dupont ¹	64	8	32.4	2.47	Burnett ¹	73	12	45.2	1.77
Ellsworth	60	8	30.9	2.91	Fort Reno ¹	72	11	43.2	1.46
Elyria	64	7	31.7	2.57	Fort Sill	74	15	44.2	2.77
Findlay ¹	63	1	31.6	2.50	Fort Supply	67	13	37.7	0.50
Fostoria ¹	65	6	31.3	2.55	Burns ¹	48	9	27.1	4.87
Frankfort	65	18	37.4	2.46	Canyon City ¹	55	16	37.2	1.45
Garrettaville ¹	63	—1	29.1	3.75	Cascade Locks ¹	54	30	42.6	13.37
Granville ¹	65	8	31.6	3.37	Comstock ¹	60	25	43.5	4.59
Gratiot	63	5	33.4	3.14	Cornelius	—	—	—	—
Greenfield ¹	60	11	34.9	2.10	Corvallis a ¹	57	28	42.4	4.02
Green Hill	62	1	31.0	2.75	Corvallis b ¹	52	26	40.9	4.31
Greenville ¹	61	10	32.2	1.83	Corvallis (near) ¹	58	30	43.2	5.57
Guyville ¹	65	9	34.4	2.23	Crook	58	11	35.5	4.45
Hackney	64								

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
Tennessee.	0	0	0	Ins.	Utah—Cont'd.	0	0	0	Ins.
Andersonville*1...	64	13	40.8	2.55	Corinne*2...	58	10	31.6	1.85
Ashwood*1...	66	20	41.1	3.42	Deseret...	67	2	31.8	0.82
Byrdstown*1...	70	21	40.5	3.24	Fillmore*1...	67	3	34.6	1.79
Carthage...	...	...	2.91	Grouse Creek*1...	50	9	29.2	1.10	
Charleston†...	...	...	3.14	Heber†...	52	8	27.6	3.95	
Clarksville*1...	73	14	41.4	3.07	Lane Park...	54	1	22.8	0.68
Clinton†...	...	...	3.04	Leban†2...	54	13	35.6	2.87	
Columbia*1...	...	...	3.09	Levan†2...	...	...	31.9	1.85	
Covington a†...	70	20	43.8	3.07	Losee†1...	53	2	27.4	0.30
Florence Station*1...	65	22	41.2	4.30	Moab†...	59	15	34.2	0.90
Franklin†...	68	17	41.0	3.46	Ogden a*2...	53	17	35.3	3.28
Greeneville†1...	63	15	39.6	2.33	Ogden b*1...	54	18	37.0	2.11
Hohenwald...	68	16	41.2	3.99	Parowan†...	63	8	34.0	0.72
Jackson*4...	18	37.0	2.82	Promontory*1...	46	6	30.8	1.05	
Jackson*1...	70	18	41.1	2.25	Provo City†...	...	...	34.6	1.00
Johnsonville†...	...	...	2.44	Randolph†...	62	7	24.0	...	
Kingston†...	...	...	2.59	Richfield†...	64	3	31.3	1.32	
London†...	...	...	3.70	Saint George†1...	70	15	40.8	1.28	
Lynville*1...	67	19	40.9	4.17	Scofield†1...	59	19	22.0	1.67
Missionary Ridge*3...	24	41.8	...	Singletree*1...	55	8	30.4	0.90	
Newport*3...	66	16	36.0	2.41	Snowville†...	50	8	31.2	0.77
Nunnelly*1...	68	19	42.3	4.02	Terrace*1...	52	20	35.4	0.27
Palmetto†...	...	...	2.24	Thistle†...	58	3	30.2	1.20	
Parksville*1...	66	20	43.1	3.97	Vermont...	...	...	...	...
Riddleton†...	68	17	42.2	4.43	Brattleboro a...	49	17	23.9	2.89
Rockwood†...	...	...	2.71	Burlington†...	49	8	22.2	2.35	
Rogersville*1...	59	19	38.4	2.03	Cornwall...	...	...	3.21	...
Rugby*1...	61	16	37.6	2.30	Enosburg Falls†...	50	32	16.2	4.62
Savannah*1...	69	23	43.5	4.04	Hartland†...	47	29	17.4	3.70
Springdale*1...	70	16	39.6	3.04	Irasburg†...	43	24	14.4	3.97
Strawberry Plains†...	...	...	2.50	Jacksonville...	48	23	18.8	0.72	
Trenton...	69 ⁸	17 ⁸	39.98	4.50	Norwich*6...	43 ⁸	27	19.5 ⁸	2.99
Waynesboro*1...	62	22	41.7	2.37	Stratford*1...	46	15	19.5	3.30
Wier*1...	66	15	38.9	3.85	Vernon*2...	48	20	20.4	4.16
Texas...	...	...	...	Well...	50	15	21.2	3.66	
Albany*1...	72	28	49.0	1.30	Woodstock...	51	34	2.0	3.67
Arlington†...	79	22	52.5	0.31	Virginia...	...	...	...	...
Arthur City†...	...	...	1.11	Abingdon†...	...	...	1.99	...	
Aurora*1...	80	25	53.1	0.23	Alexandria ¹ ...	64	12	39.0	2.02
Austin a†...	79	29	52.0	0.02	Ashland†...	73	14	41.0	2.50
Austin b*5...	81	31	57.4	...	Avon†...	83	12	41.4	0.72
Boerne*1...	77	31	52.4	1.02	Bedford City ¹ ...	68 ⁵	25	35.7 ⁸	1.87
Brady†1...	77	26	51.8	0.94	Big Stone Gap†...	60	14	33.8	2.37
Brazoria†1...	83	29	60.0	1.04	Birds Nest*1...	69	23	44.1	4.80
Brenham†...	78	33	59.0	1.92	Blacksburg ¹ ...	65	12	36.2	1.19
Brownwood†...	...	...	0.90	Buchanan†...	...	...	0.82	...	
Burnet*1...	74	29	57.2	0.95	Cape Charles†1...	65 ⁸	23	43.8	3.96
Camp Eagle Pass...	87	24	56.6	0.11	Charlottesville...	69	17	42.6	1.57
Childress†1...	76	16	44.0	0.75	Christiansburg†...	...	...	1.13	...
Coldwater†...	71	10	38.9	0.34	Clarksville†...	...	...	3.16	...
College Station...	76	28	55.8	1.73	Dale Enterprise†1...	67	11	37.6	1.63
Columbus†...	82	30	61.1	0.03	Falls Church†...	...	...	1.63	...
Corsicanab†...	74	25	56.6	0.27	Fredericksburg†...	70	7	39.6	1.88
Cuero†...	83	32	61.5	0.87	Hampton...	68	26	44.6	3.70
Dallas b†1...	70	23	50.2	0.82	Hot Springs...	64	12	38.5	4.00
Devine†...	76	25	56.1	0.45	Iowa...	...	...	...	...
Duval*1...	87	32	58.5	0.65	Jacksonville...	68	13	41.5	2.19
Eagle Pass†...	...	...	0.16	Linton†...	66	11	36.6	1.02	
Eastland*1...	71	26	50.7	0.00	Lexington†...	66	11	41.2	2.92
Flower Bluff†...	80	32	64.0	0.13	Nottoway...	71	11	41.2	2.92
Forestburg†...	72	22	50.1	0.31	Petterson†...	71	11	44.2	3.00
Fort Brown†...	86	33	64.8	0.71	Richmond a†...	74	11	41.2	2.14
Fort Clark...	77	29	56.5	0.96	Richmond b†...	...	...	1.99	...
Fort Hancock...	76	4	40.2	0.21	Riverton†...	...	...	0.70	...
Fort McIntosh...	83	29	60.8	0.00	Salem...	70	42.6	1.6	1.62
Fort Ringgold†...	89	32	65.4	0.10	Saluda†...	70	13	42.6	1.62
Fredericksburg*1...	76	24	52.0	1.10	Spotsylvania†...	72	18	41.4	4.60
Gainesville...	77	20	49.8	0.95	Standardville†...	67	18	39.6	0.59
Graham†...	78	20	48.5	1.70	Stephens City†...	68	19	38.7	0.62
Grape Vine†1...	77	24	53.4	0.75	Warsaw†...	68	19	40.8	2.72
Hallettsville†...	79	29	58.4	0.00	Woodstock†...	...	...	0.62	...
Hartley†...	61	15	38.0	0.00	Wytheville†...	64	15	36.7	1.20
Haskell...	66	38	52.3	0.61	Washington...	...	...	...	...
Highland...	79	21	51.2	0.73	Aberdeen†1...	55	29	42.8	12.18
Houston†...	80	35	52.4	1.06	Anacortes...	...	...	5.04	...
Huntsville†...	77	30	56.2	1.15	Blaine†...	54	22	39.8	8.09
Kent...	...	...	0.00	Bridgeport†...	53	6	28.8	0.30	
Laredo†...	...	...	0.19	Chehalish†...	56	25	42.1	5.29	
Llano*1...	78	16	55.0	0.80	Colfax†...	50	20	36.6	2.66
Longview†...	79	19	54.8	2.62	Crystal Springs*1...	58	35	47.1	...
McGregor†...	65	23	58.6	0.75	Davenport†...	61	24	28.2	2.10
Marshall†...	74	28	54.6	1.65	Dayton†...	58	21	39.8	1.91
Menardville*1...	76	22	50.9	1.07	East Sound†...	55	30	43.2	6.12
Mountain Spring†...	77	23	52.1	0.80	Hunters ¹ ...	40	6	25.0	3.05
New Braunfels†...	79	27	57.0	0.58	...	...	...	...
Orange†...	76	28	57.6	3.02	...	...	...	...
Paris†...	74	22	51.8	1.60	Elbe...	...	...	11.16	...
Rio Grande City†...	...	...	0.16	Ellensburg†...	56	8	32.5	0.33	
Roby†4...	81	18	46.8	0.62	Ferry†...	57	22	41.3	7.76
Rockport*1...	76	38	60.8	...	Fort Simcoe...	56	20	38.0	1.30
Round Rock†...	86	26	58.4	0.91	Fort Spokane...	45	11	28.6	2.25
San Marcos†...	...	...	0.46	Fort Townsend ¹ ...	55	29	42.0	3.24	
Sierra Blanca...	74	14	47.2	0.90	Hunters ¹ ...	40	6	25.0	3.05
Silver Falls†1...	75	19	46.4	1.00	Madrone*1...	56	29	43.0	5.66
Stella*1...	82	28	58.9	0.28	Moxee Valley†...	55	15	34.1	0.56
Sulphur Springs†1...	78	21	51.0	1.42	Olga†1...	51	30	42.8	6.49
Temple†...	78	27	53.0	0.37	Pine Hill ¹ ...	50	28	39.9	3.84
Waco†...	75	26	54.4	0.25	Pomeroy†...	57	25	40.8	1.61
Weatherford†...	75	23	50.2	0.27	Pullman†1...	48	17	35.0	1.54
Wichita Falls†...	82	30 ²	59.2 ²	1.83	Rosalia†1...	46	18	33.8	1.87
Utah...	...	...	...	...	...	...	...	...
Blue Creek*2...	56	14	39.9	0.10	Silver Creek*1...	58	24	41.8	7.64
Castle Gate†1...	53	5	29.7	1.16	Tacoma†...	58	24	41.1	6.64
Cisco†...	50	9	27.9	1.40	Union City*1...	51	26	41.0	11.86

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
Washington—Cont'd.	0	0	0</td						

Reports received too late, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip. in.	Stations.	Temperature. (Fahrenheit.)			Precip. in.
	Max.	Min.	Mean			Max.	Min.	Mean	
New Mexico.	0	0	0	Ins.	Texas—Cont'd.	0	0	0	Ins.
Fort Wingate.....	11	48.8	0.30		San Antonio.....	83	32	57.9	4.10
Olio [†]	16	39.2	T.		Utah.				
New York.					Deseret [†]	68	2	35.6	0.14
Lyons ¹	62	22	38.9	1.05	Mexico.				
Texas.					Ciudad Porfirio Diaz	86	34	61.4	0.23
Albany ² [†]	84	32	49.8	0.77	Topolobampo ³ ...	88	60	69.8	0.00
Burnet ² [†]	79	30	53.3	3.01					

* Extremes of temperature from observed readings of dry thermometer.

† Weather Bureau instruments.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

1 Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. + 4.

2 Mean of 8 a. m. + 8 p. m. + 2.

3 Mean of 7 a. m. + 7 p. m. + 2.

4 Mean of 6 a. m. + 6 p. m. + 2.

5 Mean of 7 a. m. + 2 p. m. + 2.

6 Mean from readings at various hours reduced to true daily mean by special tables.

7 Mean from hourly readings of thermograph.

8 Mean of 7 a. m. + 2 p. m. + 9 p. m. + 3.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An Italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small Roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance, "2" denotes 24 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

Corrections: Idaho, Kootenai, September, 1893, insert total precipitation 10.93 inches. Oregon, Arlington, November, 1893, make precipitation 2.66 instead of 1.96. Texas, Llano, November, 1893, make precipitation 1.22 instead of 3.02. West Virginia, Spencer, November, 1893, make precipitation 0.47 instead of 0.30. October, 1893, page 272, under head of "The observer at Pensacola, Fla., reports," October 3, should read October 2.

NOTE.—The following changes have been made in names of stations: Maryland, Barren Creek Springs, changed to Mardeia Springs. North Dakota, Sykeston, changed to Lemert.

Data from Canadian stations for the month of December, 1893.

Station.	Pressure.			Temperature.	Precipitation.	Prevailing direction.
	Mean not reduced.	Mean reduced.	Departure from normal.			
Saint Johns, N. F.	Inches.	Inches.	Inches.	°	°	Inches.
Sydney, N. S.	29.88	29.94	+ .06	28.4	— 0.6	7.29
Grindstone, G. S. L.						+ 2.57
Sandy Point, N. F.						SW.
Halifax, N. S.	29.86	30.00	+ .05	27.4	— 1.1	10.25
Grand Manan, N. B.	29.96	30.01	—	26.8		7.81
Yarmouth, N. S.	29.94	30.02	+ .04	30.0	— 1.5	8.61
Saint Andrews, N. B.	29.94	29.99	—	20.8		7.01
Charlottetown, P. E. I.	29.91	29.95	—	22.8		6.51
Chatham, N. B.	29.98	30.00	+ .06	11.4	— 5.1	4.33
Father Point, Que.						+ 1.36
Quebec, Que.	29.70	30.06	+ .05	9.9	— 6.1	5.09
Montreal, Que.						+ 0.78
Rockliffe, Ont.	29.50	30.05	+ .04	5.8	— 8.7	3.01
Kingston, Ont.	29.72	30.00	+ .01	19.2	— 5.8	4.54
Toronto, Ont.	29.66	30.07	+ .01	23.6	— 4.4	4.60
White River, Ont.	29.62	30.13	—	6.0	— 13.8	2.23
Port Stanley, Ont.	29.42	30.09	+ .02	26.2	—	4.60
Saugeen, Ont.	29.28	30.04	+ .02	23.8	— 3.2	6.10
Parry Sound, Ont.	29.29	30.03	—	15.7	— 5.3	8.16
Port Arthur, Ont.	29.31	30.07	+ .05	3.2	— 7.3	1.08
Winnipeg, Man.	29.26	30.19	+ .09	8.0	— 11.0	0.62
Minnedosa, Man.	28.14	30.13	+ .03	4.8	— 7.3	0.82
Qu'Appelle, Assiniboia.	27.64	30.10	—	0.5	— 3.5	0.62
Medicine Hat, Assiniboia.	27.55	30.01	—	18.2	+ 3.2	1.16
Swift Current, Assiniboia.	27.30	30.04	—	13.6	+ 2.6	1.02
Calgary, Alberta.	26.27	29.95	—	17.6	+ 3.1	0.57
Prince Albert, Sask.	26.41	30.09	—	8.2		0.40
Edmonton, Alberta.	27.51	30.01	—	10.4	— 5.5	3.21
Battleford, Saskatchewan	28.18	30.07	—	1.0		0.34
Spences Bridge, B. C.	29.22	30.08	—	27.9	—	0.43
Sable Island.						
Hamilton, Bermuda	30.10	30.26	+ .14	65.0	—	4.33

NOTE.—As the data from North Dakota, given on page 373, was received after the maps and text of this REVIEW had been completed, the reader will make such corrections as may be found necessary.

Climatological data for December, 1893—Weather Bureau Stations.

Districts and stations.	Elevation above sea-level, feet.	Length of record, years.	Pressure, in inches.		Temperature of the air, in degrees Fahrenheit.						Humidity and precipitation.				Wind.				Mean temperature data since opening of station													
			Mean pressure, 8 a. m. and 8 p. m. + 2.	Mean reduced.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.	Departure from normal.	Days with .01, or more.	Total move- ment, miles.	Prevailing direc- tion.	Maximum velocity.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Highest for month.	Lowest for month.	Year.	Year.				
			Mean max. and min. + 2.	Mean max. and min. + 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.	Departure from normal.	Days with .01, or more.	Total move- ment, miles.	Prevailing direc- tion.	Miles per hour.	Date.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Highest for month.	Lowest for month.	Year.	Year.				
<i>New England.</i>																																
Eastport	76	21	29.92	30.02	+.05	22.4	-4.9	52	3	30	-11	14	15	45	16	73	4.88	-1.4	20	9,848	nw.	45	ne.	6	1	13	17	7-5.33.0	1891	17.6	1890	
Portland	103	22	29.93	30.04	-.02	22.0	-5.6	46	25	28	-9	14	16	29	16	76	5.42	-1.9	19	5,646	nw.	30	w.	11	6	11	14	6-3.37.0	1881	17.0	1890	
Northfield	872	7	29.99	30.10	-.05	16.4	-5.2	54	25	27	-17	14	6	45	10	76	2.92	-0.2	10	6,713	s.	36	sw.	10	4	13	14	6-7.30.6	1891	8.9	1890	
Boston	125	24	29.95	30.09	-.04	30.4	-2.3	57	25	38	0	14	23	27	22	73	5.16	-1.7	16	8,760	w.	48	w.	11	8	9	14	6-3.40.4	1891	21.9	1890	
Nantucket	14	5	30.07	30.08	+.02	36	1	10	57	4	43	7	14	30	31	31	80	4.21	-0.7	15	9,644	nw.	52	ne.	5	11	12	15	5-8.41.4	1891	31.1	1890
Woods Hole	16					34.4	-2.0	57	3	41	5	14	28	32	32	56	5.67	-2.5	16	14,326	n.	57	ne.	5	10	5	16	6-3.41.5	1891	28.0	1870	
Vineyard Haven	8					38.2	+0.8	61	3	53	47	10	14	29	33	33	73	7.30	-4.6	16	nw.	13	4	14	43.8	1891	31.9	1890	
Block Island	27	14	30.08	30.11	+.05	35	-2	58	3	41	9	14	29	30	30	77	4.55	-0.6	16	14,023	nw.	52	ne.	5	12	11	15	5-2.42.2	1881	31.4	1890	
Narragansett Pier	12					33.4	-0.4	58	4	42	0	14	23	34	34	56	5.05	-1.1	13	nw.	...	...	...	18	3	10	40.9	1891	28.8	1890
New Haven	107	22	29.99	30.11	+.02	31	-0	57	25	36	0	14	24	31	22	73	3.22	-0.4	16	6,725	sw.	34	n.	26	11	9	11	5-6.39.2	1891	20.3	1870	
New London	45	23	30.07	30.12	+.05	32	-1	52	5	40	5	14	25	36	25	75	4.16	+0.6	17	6,108	n.	34	s.	3	9	10	12	5-8.40.0	1891	23.7	1890	
<i>Mid. Atlantic States.</i>						38.62	+0.5	63	5	40	5	14	25	36	36	75	2.75	-0.6	16	nw.	...	...	...	13	4	14	43.8	1891	31.9	1890
Albany	85	20	30.03	30.13	+.05	25	-7	46	54	25	33	-3	14	19	26	21	81	2.54	-0.3	15	6,259	nw.	43	n.	26	5	9	17	7-0.38.7	1881	17.2	1870
New York, N. Y.	185	24	29.93	30.14	-.04	35	-1	0	73	16	41	13	14	29	24	27	74	3.49	+0.3	15	8,598	sw.	42	sw.	26	5	15	11	6-3.41.8	1891	25.1	1870
Harrisburg	377	6	29.74	30.17		33	-5	55	63	25	40	10	6	27	29	27	79	1.91	...	12	5,588	w.	38	sw.	26	5	14	5-7.40.2	1889	29.4	1890	
Philadelphia	117	23	30.03	30.16	-.03	36	-4	54	62	16	43	17	14	30	25	28	74	3.13	+0.4	13	9,168	sw.	43	sw.	26	8	15	8-7.43.6	1889	25.1	1870	
Atlantic City	53	21	30.10	30.15	-.04	37	-8	51	29	44	15	14	31	26	33	82	2.44	-1.4	11	9,665	n.	55	sw.	26	11	10	10	5-5.43.6	1889	26.9	1870	
New Brunswick						33.2	-0.2	61	16	41	9	14	25	30	30	83	3.12	-1.4	14	n.	...	...	...	14	10	11	2.1	1889	45.1	1870
Baltimore	179	23	29.96	30.17	+.03	36	-6	56	25	46	18	6	31	31	26	71	2.29	-0.8	11	5,798	sw.	33	nw.	13	12	6	4-9.46.0	1889	28.4	1870		
Washington, D. C.	112	24	30.06	30.15	+.02	38	-3	53	6	47	11	6	30	34	28	71	2.27	-0.7	10	5,032	s.	36	sw.	26	14	9	8-7.45.5	1889	26.5	1870		
Cape Henry	20					48.2	-5	54	5	42	27	21	40	36	36	73	3.76	-0.4	10	nw.	...	...	...	16	7	8	52.4	1889	34.1	1870
Lynchburg	685	23	29.46	30.22	+.06	41	-8	59	25	52	20	21	32	39	30	70	2.12	-1.4	9	5,349	sw.	36	sw.	26	13	9	5-5.50.6	1889	29.9	1870		
Norfolk	57	23	30.14	30.21	+.07	45	-1	52	73	3	54	28	21	37	35	38	80	3.05	-0.7	9	7,037	n.	41	w.	5	16	10	9	4-6.51.4	1889	33.2	1870
<i>S. Atlantic States.</i>						50.0	-1.7	63	5	40	27	21	40	34	34	81	3.06	-0.0	6	5,336	ne.	33	w.	16	12	8	11	4-9.62.2	1891	48.4	1870	
Charlotte	773	16	29.38	30.22	+.05	45.4	-1.5	68	25	55	25	18	36	32	33	69	1.62	-3.1	10	5,814	sw.	38	sw.	16	16	8	7-4.054.7	1889	38.1	1870		
Hatteras	11	14	30.20	30.21	-.07	49	-8	72	3	56	30	14	43	45	45	83	3.86	-2.1	9	11,531	w.	56	dw.	5	14	9	8-5.054.6	1889	41.1	1886		
Kittyhawk	9	19	30.18	30.19	-.01	47	-6	70	3	55	30	21	40	42	40	78	1.79	-3.5	9	11,708	w.	50	b.	5	19	4	8-3.74.5	1889	36.3	1870		
Raleigh	388	7	29.80	30.23	-.03	44	-6	74	2	54	21	6	35	36	34	72	4.38	-1.7	7	5,273	sw.	25	dw.	26	17	3	11	3-9.53.4	1889	40.0	1870	
Southport	34	19	30.20	30.23	-.07	49	-6	68	3	58	29	14	42	25	46	89	3.79	+0.4	10	7,321	w.	40	sw.	16	16	7	8-3.95.4	1889	39.5	1870		
Wilmington	78	23	30.15	30.24	-.05	51	-1	74	3	60	31	18	42	31	42	83	3.27	-0.2	9	6,409	sw.	42	s.	16	19	3	9-5.56.5	1889	38.6	1870		
Charleston	53	23	30.20	30.25	-.03	49.9	-1	73	25	60	21	21	40	34	34	82	4.56	+0.9	6	5,952	n.	35	sw.	16	13	14	4-6.10.0	1889	43.4	1870		
Augusta	209	22	30.05	30.29	+.10	50	-3	74	3	61	25	21	40	34	39	75	3.50	-0.2	7	4,442	nw.	25	w.	17	16	9	6-3.53.7	1889	38.5	1870		
Savannah	98	23	30.15	30.26	-.02	58	-5	76	3	64	31	18	45	32	45	82	3.12	-0.4	6	6,091	n.	30	s.	16	11	11	6-4.15.1	1889	44.0	1870		
Jacksonville	43	23	30.20	30.25	-.09	58.8	-2	77	3	68	35	18	50	27	49	81	3.08	-0.0	6	5,336	ne.	33	w.	16	12	8	11	4-9.62.2	1891	48.4	1870	
<i>Florida Peninsula.</i>						58.9	-0.5	74	7	67	24	15	60	62	62	82	1.70	-0.8	4	8,721	nw.	35	e.	14	15	15	1	4-2.70.6	1891	63.4	1888	
Jupiter	28	6	30.18	30.21	...	68.0	-1	81	7	74	44	18	62	24	60	82	1.85	...	8	8,721	nw.	35	e.	14	15	15	1	4-2.70.6	1891	63.4	1888	
Key West	22	24	30.17	30.19	+.07	70	-8	52	8	74	56	15	63	28	63	81	1.18	-0.7	7	9,332	ne.	36	sw.	14	13	13	5-4.84.7	1879	64.7	1886		
Tampa	36	...	30.20	30.24	...	63.3	-1	82	16	73	38	19	54	31	55	84	1.32	...	4	4,839	ne.	30	s.	16	11	17	3-4.6	1886	34.6	1870		
Titusville	44	7	30.20	30.24	...	63.3	-0.5	82	30	71	38	19	55	27	56	84	2.40	-0.8	9	8,190	nw.	42	ne.	14	18	11	2-3.66.2	1891	57.6	1888		
<i>Eastern Gulf States.</i>						53.8	-1.8	79	12	62	25	4	44	29	40	69	1.82	-3.1	5	5,807	se.	52	w.	15	18	5	8-3.56.3	1889	40.9	1876		
Atlanta	16	29	29.05	30.27	+.07	46.6	-8	67	25	55	21	5	38	32	36	72	3.18	-1.8	4	7,901	nw.	48	sw.	3	14	7	10-5.257.2	1889	40.6	1878		
Pensacola	56	15	30.17	30.23	-.07	56.5	-1.5	70	30	65	26	5	49	32	47	76	1.25	-3.5	6	6,176	dw.	16	12	6	13	12	5-1.56.2	1889	50.5	1876		
Mobile	57	23	30.19	30.25	-.06	55.5	-2	74	29	65	26	5	40	30	48	84	1.84	-2.7	12	5,807	n.	30	sw.	13	12	11	5-5.61.6	1889	43.8	1876		
Montgomery	257	22	29.97	30.26	+.02	52.0	-0	75	1	52	24	15	42	35	42	77	2.29	-2.7	9	4,704	nw.	38	w.	16	7	15	9-5.59.5	1889	41.4	1876		
Meridian</td																																

Climatological data for December, 1893—Weather Bureau Stations—Continued.

Districts and stations.	Elevation above sea-level, feet.	Length of record, years.	Pressure, in inches.		Temperature of the air, in degrees Fahrenheit.						Humidity and precipitation.				Wind.			Mean temperature data since opening of station													
			Mean pressure, 8 a. m. and 8 p. m. \pm 2.	Mean reduced.	Mean max. and min. \pm 2.	Departure from normal.	Mean maximum.	Mean minimum.	Date.	Mean maximum.	Mean minimum.	Date.	Mean maximum.	Greatest daily range.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.	Total movement, miles.	Prevailing direction.	Maximum velocity.	Highest for month.	Lowest for month.	Year.								
			Mean.	Mean.	Mean.	Departure from normal.	Maximum.	Minimum.	Date.	Mean.	Mean.	Date.	Mean.	Range.	Mean.	Per cent.	Days with .01, or more.	Miles per hour.	Direction.	Date.	Clear days.	Partly cloudy days.	Cloudy day.	Average cloudiness, tenths.	Month.	Year.					
<i>Up. Miss. Val.—Con.</i>																															
Davenport.....	613	23	29.44	30.13	.00	24.3	-4.0	59	24	32	-5	1	17	30	20	80	1.67	-0.1	15	8,399	w.	52	sw.	18	4	13	14	6.8-42.5	1877	15-4 1877	
Des Moines.....	869	16	29.15	30.15	.00	23.0	-3.0	59	24	32	-5	1	14	44	19	82	1.30	-0.2	12	6,195	nw.	30	w.	25	9	9	13	6.1-39.6	1889	18-4 1889	
Dubuque.....	651	21	29.37	30.11	+.00	22.2	-3.5	58	24	30	-11	1	15	30	15	76	1.33	-0.6	12	4,517	sw.	30	sw.	18	9	7	15	6.2-40.0	1877	13-7 1877	
Keokuk.....	613	23	29.45	30.14	+.01	29.0	-0.9	66	23	38	-6	1	20	38	22	76	0.90	-1.2	10	7,142	sw.	35	sw.	18	7	13	11	5.4-42.9	1877	18-8 1877	
Gairo.....	359	23	29.81	30.21	+.06	40.0	+0.5	67	15	47	14	4	33	28	31	74	1.60	-1.5	8	7,947	sw.	35	s.	15	13	8	10	4.8-54.1	1889	27-3 1889	
Springfield, Ill.....	644	15	29.45	30.17	+.03	30.3	-3.0	61	15	48	0	1	22	35	25	75	1.03	-1.5	9	8,934	nw.	33	w.	15	6	10	15	5.6-54.4	4-1889	26-0 1889	
Hannibal.....	534	23	29.55	30.15	-.03	33.0	-0.9	68	23	40	-1	4	24	39	25	75	0.37	.....	8	8,339	nw.	37	sw.	15	7	14	10	5.7-7	1889	24-9 1889
Saint Louis.....	571	23	29.54	30.18	+.03	35.3	-0.9	66	11	44	8	1	29	31	27	69	1.32	-1.1	7	10,453	s.	42	w.	15	11	9	11	5.2-49.8	1889	24-9 1877	
<i>Missouri Valley.</i>																															
Columbia.....	356	23	29.60	30.17	-.01	35.4	-2.1	66	24	45	2	1	26	40	26	71	0.55	.....	8	7,279	sw.	38	sw.	15	12	11	8	4.9-10.4	1889	27-1 1889
Kansas City.....	963	6	29.10	30.17	-.01	35.4	-2.1	66	24	45	2	1	26	40	26	71	0.43	-1.1	10	8,162	s.	38	sw.	15	11	9	11	5.0-45.4	1889	31-5 1889	
Springfield, Mo.....	1,350	8	28.70	30.18	+.03	35.6	-1.6	67	23	48	7	4	30	35	29	71	0.99	-1.5	7	8,624	s.	35	sw.	15	13	10	8	4.8-51.8	1889	31-5 1889	
Topeka.....	7	27	28.50	30.16	-.04	36.6	-2.4	67	22	48	3	1	26	48	21	71	0.35	0.7	5	5,945	sw.	24	w.	18	10	9	12	5.7-39.4	1889	17-3 *	
Omaha.....	1,123	23	28.50	30.16	-.04	36.8	-0.2	60	23	39	-5	1	18	38	21	80	1.13	-0.1	6	7,382	sw.	48	n.	24	12	6	13	5.9-35.6	1889	19-2 1889	
Valentine.....	2,613	9	27.27	30.14	+.01	35.8	-0.6	60	21	36	-10	1	15	41	17	72	0.83	-0.2	7	7,579	sw.	38	nw.	15	10	11	10	5.4-5	1889	24-5 1889	
Sioux City.....	1,165	10	28.81	30.14	36.0	-0.1	60	21	49	2	8	12	11	45	16	85	1.37	10	6,207	se.	36	sw.	18	10	11	10	5.4-5	1889	24-5 1889
Pierre.....	1,470	10	28.46	30.13	.....	30.2	-0.2	59	22	39	-11	12	11	40	14	79	0.63	.....	10	9,490	nw.	44	nw.	4	9	9	13	5.9-27.9	1889	8-6 1889
Huron.....	1,310	13	28.64	30.15	-.04	14.0	-4.2	55	4	25	-20	12	3	52	10	85	1.01	-0.2	11	6,344	nw.	32	nw.	18	6	14	11	5.9-34.4	1889	11-8 1889	
Yankton.....	1,330	21	28.72	30.13	-.04	10.4	-4.6	54	22	38	-10	*	10	44	14	80	1.74	-0.9	10	6,344	nw.	32	nw.	18	6	14	11	5.9-34.4	1889	11-8 1889	
<i>Northern Slope.</i>																															
Bayre.....	2,477	14	27.29	30.03	-.12	23.0	-5.3	52	21	30	-20	12	16	35	18	81	0.38	-0.3	8	7,694	sw.	40	sw.	15	5	16	10	6.0-33.0	1885	3-5 1885	
Miles City.....	2,374	17	27.44	30.05	.....	23.8	-3.5	49	17	32	-17	12	14	31	18	83	0.55	+0.3	9	5,446	w.	24	w.	28	10	13	10	6.0-29.6	1885	3-8 1885
Helena.....	4,118	4	25.79	30.13	-.04	31.2	-1.7	57	51	35	-1	1	24	41	21	66	0.55	-0.5	5	6,326	sw.	42	sw.	2	13	4	14	5.3-21.2	1883	7-0 1883	
Rapid City.....	3,280	8	26.58	30.09	-.09	28.1	-3.3	61	21	38	-7	1	18	34	18	69	0.39	+0.2	11	6,344	sw.	37	sw.	4	8	9	14	6.0-35.2	1886	22-4 1886	
Cheyenne.....	6,105	23	23.96	30.17	-.00	32.8	+3.3	57	13	43	9	30	24	34	19	60	0.53	+0.3	4	9,743	sw.	50	w.	27	13	11	10	4.4-5.6	1889	18-8 1889	
Lander.....	5,377	5	24.61	30.21	.....	26.8	-.....	56	17	40	-8	27	13	43	14	66	0.76	.....	3	3,395	sw.	42	sw.	1	25	4	2	6.0-5.6	1889	24-5 1889
Kearney.....	2,200	7	27.74	30.17	.....	30.4	-0.4	61	22	43	0	1	19	37	19	71	1.17	.....	6	9,076	sw.	43	nw.	15	10	7	6	4.6-7.6	1889	24-6 1889
North Plateau.....	2,841	20	27.10	30.19	-.01	29.5	-1.8	62	21	43	-2	1	17	44	16	67	0.23	-0.8	3	6,675	w.	35	nw.	16	9	19	3	4-5.37	2-1889	15-0 1877	
<i>Middle Slopes.</i>																															
Colorado Springs.....	6,098	10	24.01	30.17	.....	33.9	-0.6	58	13	46	2	30	23	39	13	48	0.03	-0.1	1	6,846	n.	52	nw.	2	16	9	13	6.3-9.40.8	1889	19-8 1877
Denver.....	5,257	23	24.75	30.16	-.02	38.2	+4.2	65	1	49	8	30	27	43	16	43	0.35	-0.3	7	6,456	sw.	48	sw.	4	13	13	10	5.4-5.40.5	1889	22-6 1877	
Pikes Peak.....	17	17	17.60	.....	.....	6.6	-.....	21	18	11	-18	30	2	24	1	73	0.04	.....	11	24,216	w.	105	sw.	1	11	9	11	5.3-9.8	1875	0-3 1875
Pueblo.....	4,734	6	25.27	30.16	.....	36.6	-.....	64	11	51	8	6	22	42	15	73	0.29	.....	5	5,680	w.	42	w.	14	11	10	4	4-5.42.8	1889	27-1 1889
Concordia.....	1,410	9	28.60	30.16	+.01	35.6	+3.1	65	23	46	4	1	25	36	24	72	0.41	-0.3	3	5,184	sw.	29	w.	23	11	7	11	3.0-4.0	1889	24-2 1889	
Dodge City.....	2,523	20	27.45	30.17	-.01	30.7	+5.5	74	14	52	9	1	26	48	23	64	0.10	-0.6	3	5,184	sw.	24	13	5	13	13	10	4.4-4.40.4	1889	21-0 1889	
Wichita.....	1,366	6	28.67	30.19	.....	39.7	-0.9	70	22	50	9	1	30	35	28	70	0.67	.....	4	7,552	sw.	34	sw.	24	16	10	6	4-4.45.4	1889	27-6 1889
Oklahoma City.....	1,239	8	28.86	30.23	.....	35.2	-2.2	72	8	54	23	28	35	32	23	46	1.01	-0.6	2	3,773	se.	36	sw.	13	15	10	6	4-4.45.4	1889	33-2 1889
<i>Southern Slopes.</i>																															
Abilene.....	1,748	9	28.35	30.22	+.04	31.0	-0.4	61	2	61	21	1	41	51	31	55	0.52	-0.7	2	9,619	s.	50	sw.	2	19	5	7	3-35.6	1889	40-3 1889	
Amarillo.....	3,691	20	26.33	30.20	.....	39.8	-0.8	65	23	49	17	1	30	34	26	66	0.43	.....	7	12,206	s.	64	sw.	24	15	10	6	4-1	1889	24-5 1889
<i>Southern Plateau.</i>																															
El Paso.....	3,766	16	26.32	30.24	+.05	31.7	-1.0	53	1	43	5	30	25	25	13	46	0.42	-0.2	3	6,390	sw.	41	ne.	2	21	8	2	2.8-53.2	1889	40-2 1889	
Santa Fe.....	7,051	12	21.31	30.23	+.05	33.7	-1.0	53	1	43	5	30	25	25	13	46	0.49	-0.2	5	5,112	se.	35	sw.	2	20	9	2	3-39.8	1889	25-6 1889	
Tucson.....	2,432	11	27.60	30.16	.....	50.4	-1.6	67	17	67	23	30	24	36	25	73	0.49	-0.6	5	5,172	sw.	36	ne.	3	19	7	5	3-52.9	1889	44-4 1889
Tuma.....	141	18	29.97</																												

Letters of the alphabet denote number of days missing from the record.

* Two or more directions, dates, or years. † Received too late to be considered in departures, etc. ‡ All temperature and precipitation normals and extremes of temperature are obtained from Fort Keogh records. || All temperature and precipitation normals and extremes of temperature are obtained from Fort Buford records. § All data except precipitation for 20 days only.

Chart I. Tracks

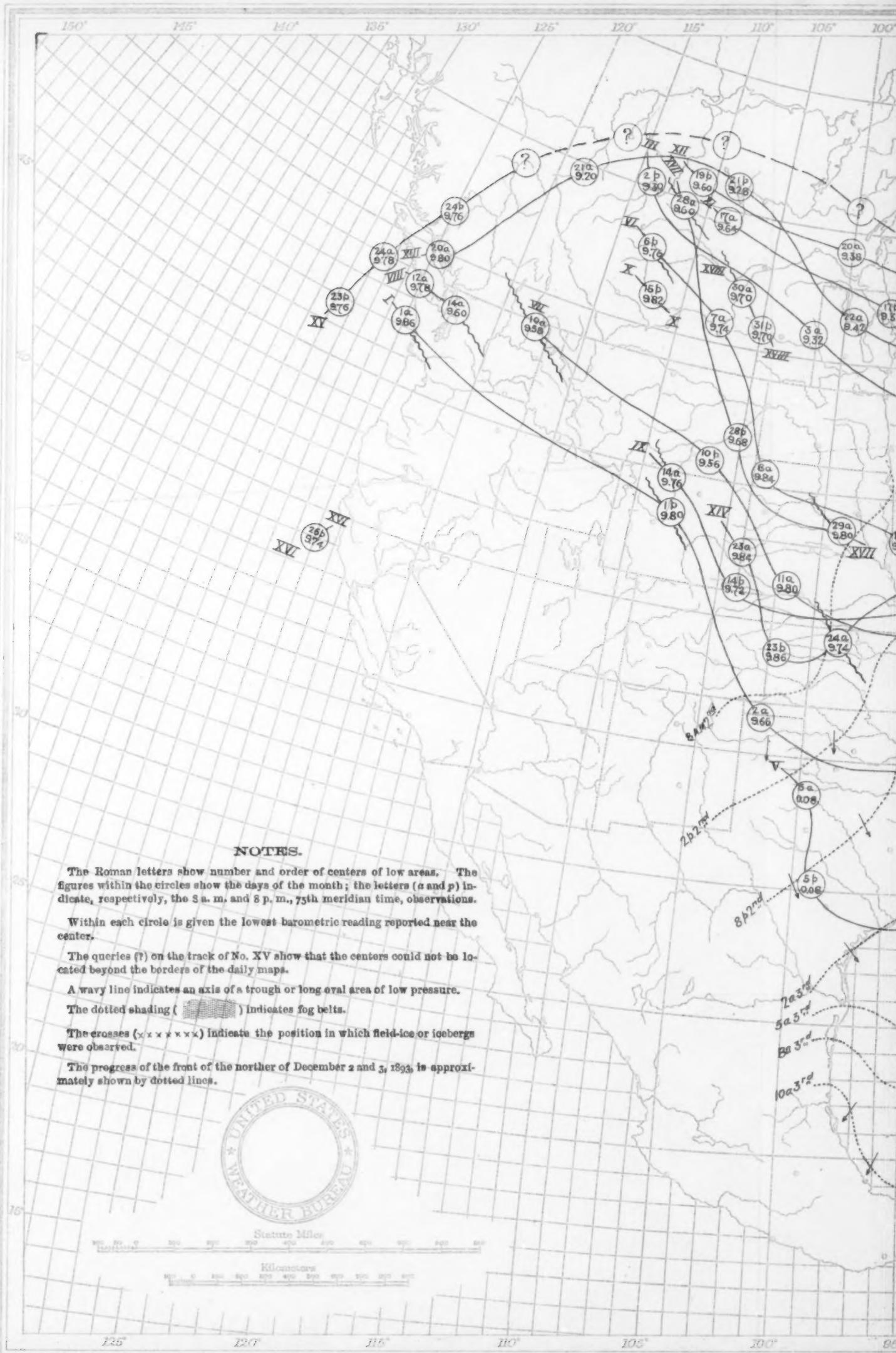
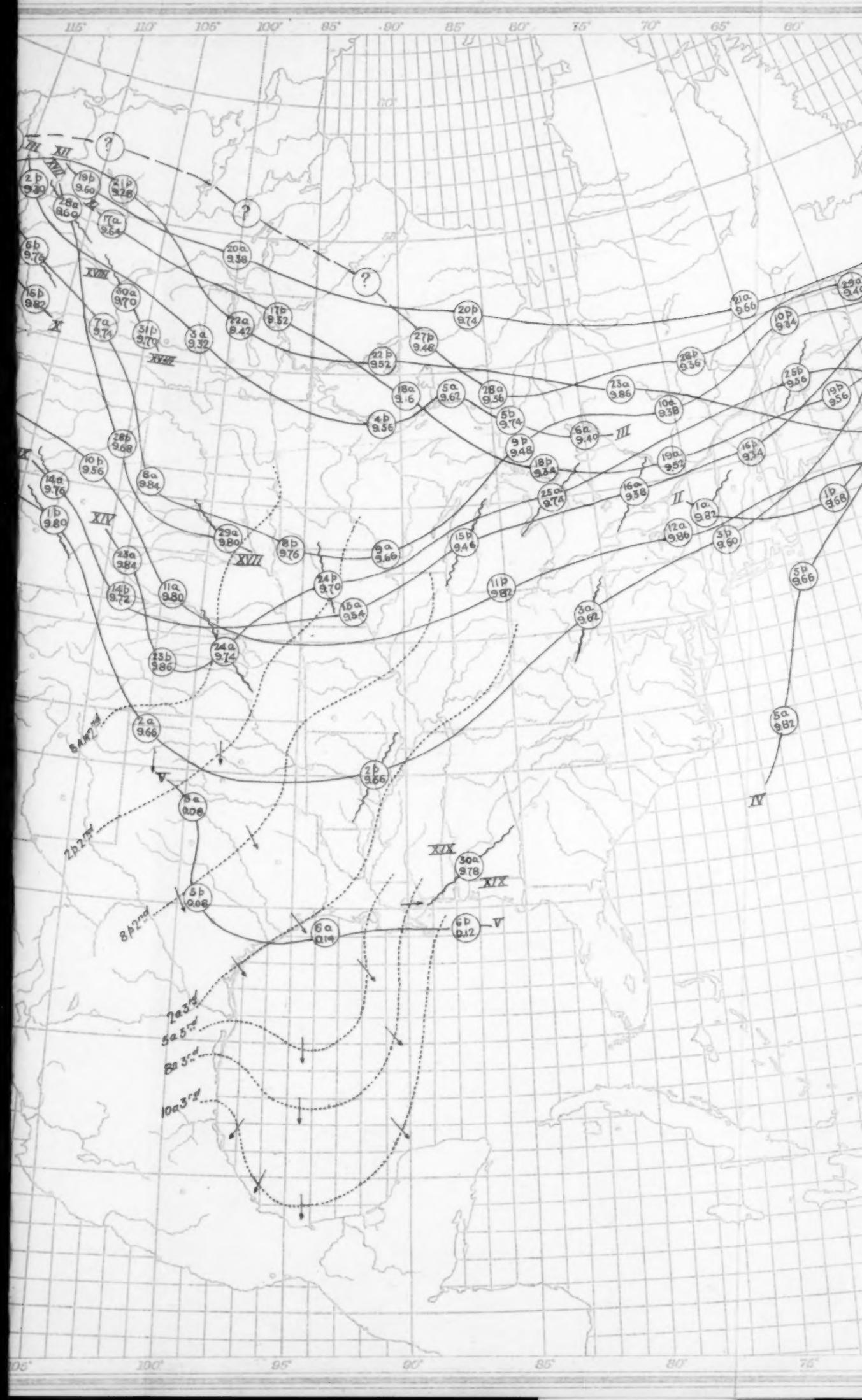
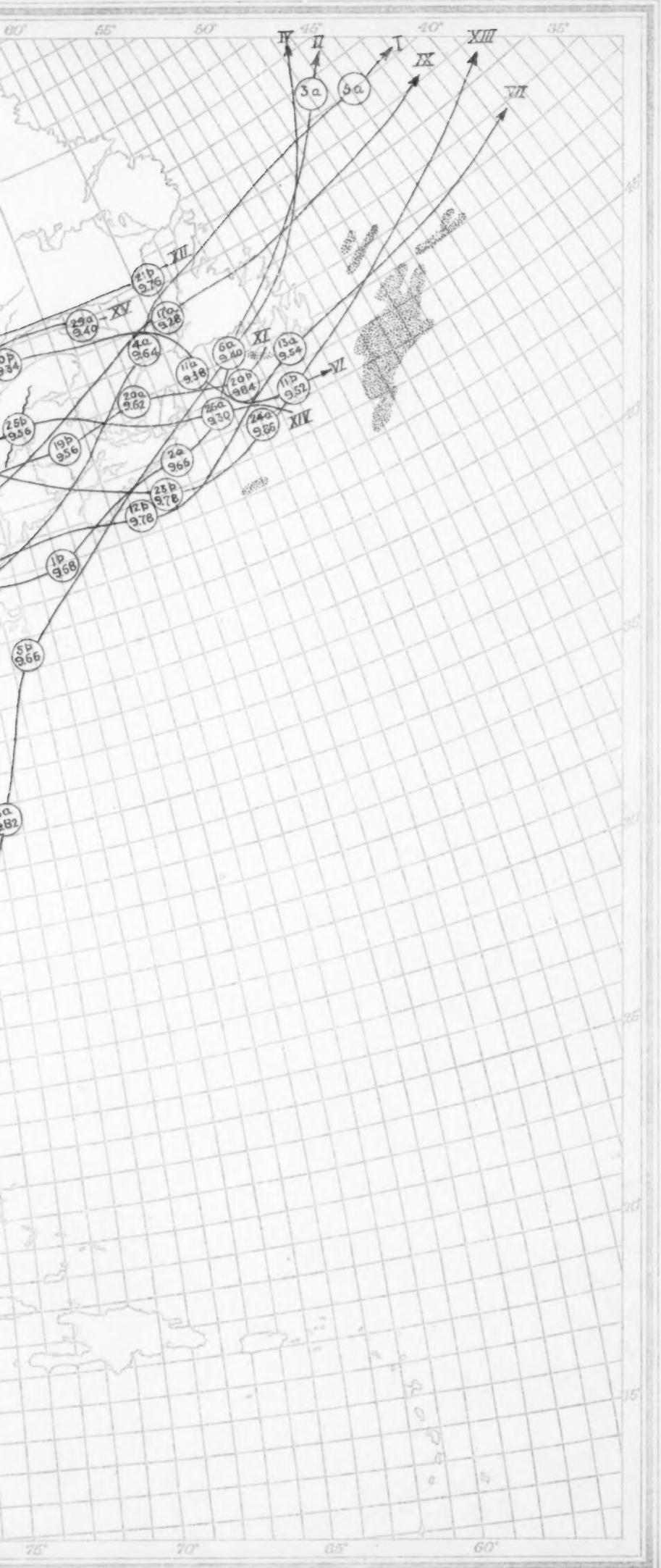


Chart I. Tracks of Centers of Low Areas. December, 1893.





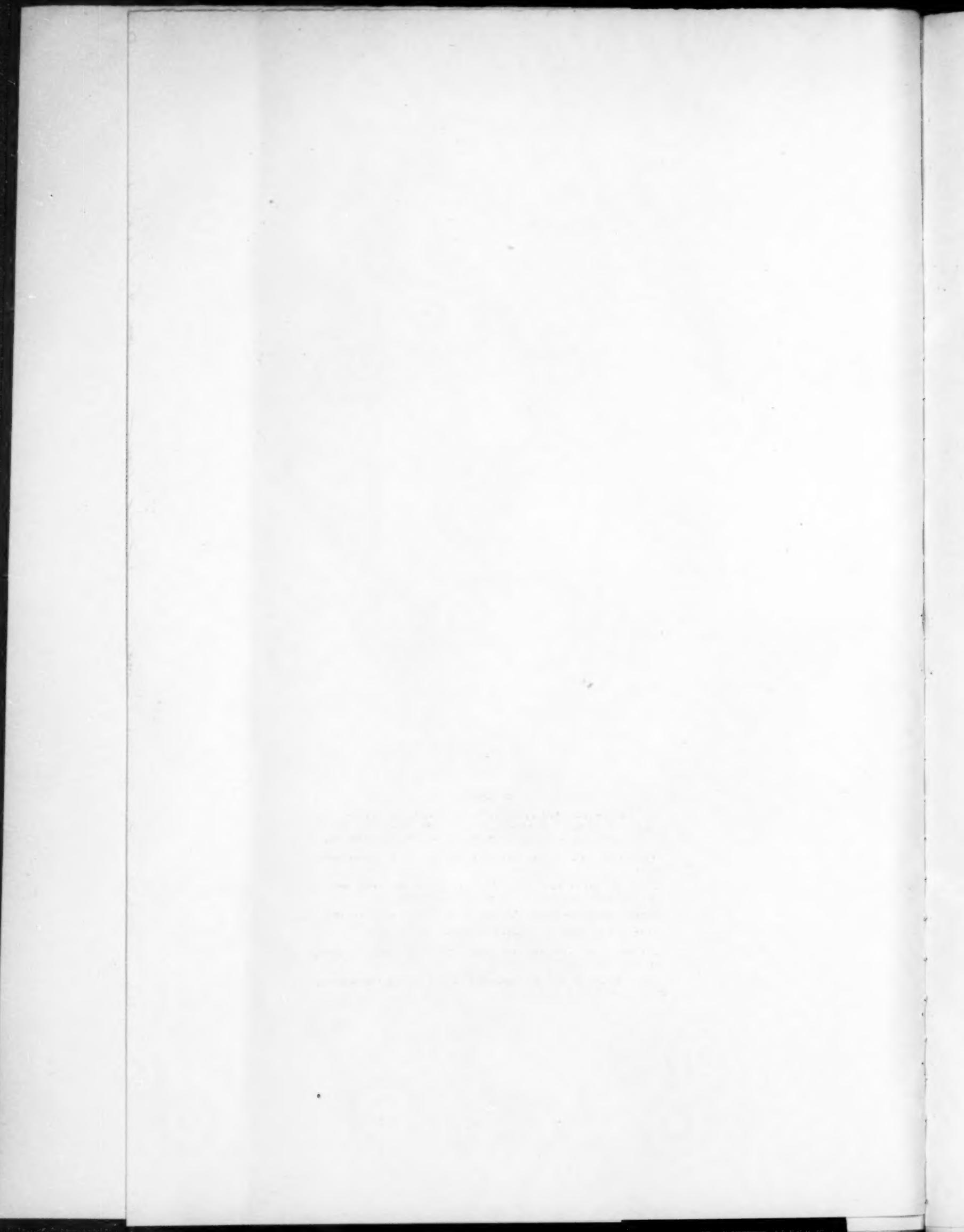


Chart II. Isobars, Isotherms, and Prevailing Winds. December, 1893.

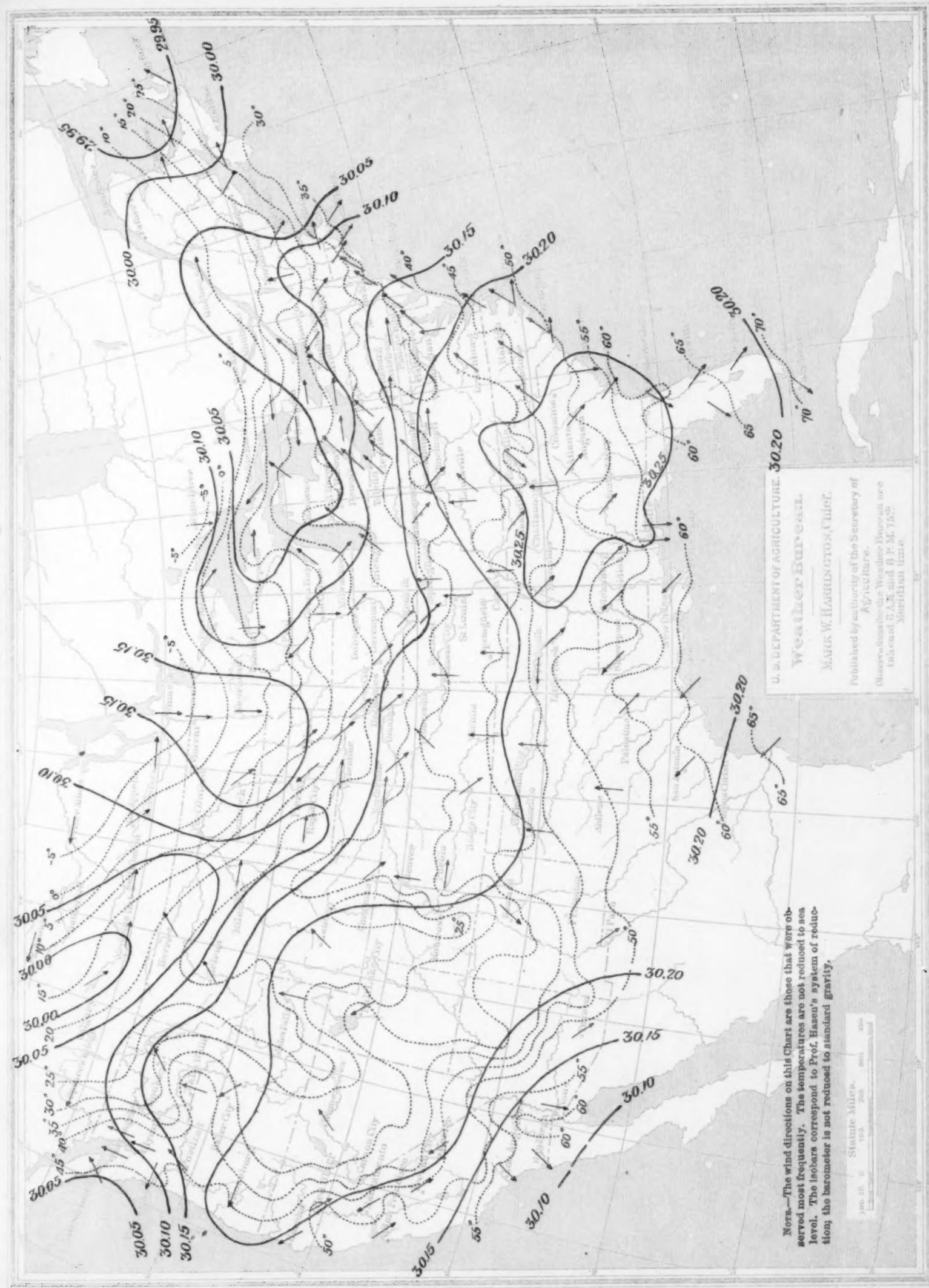


Chart III. Total Precipitation. December, 1893.



Chart IV. Tracks of Centers of High Areas. December, 1893.

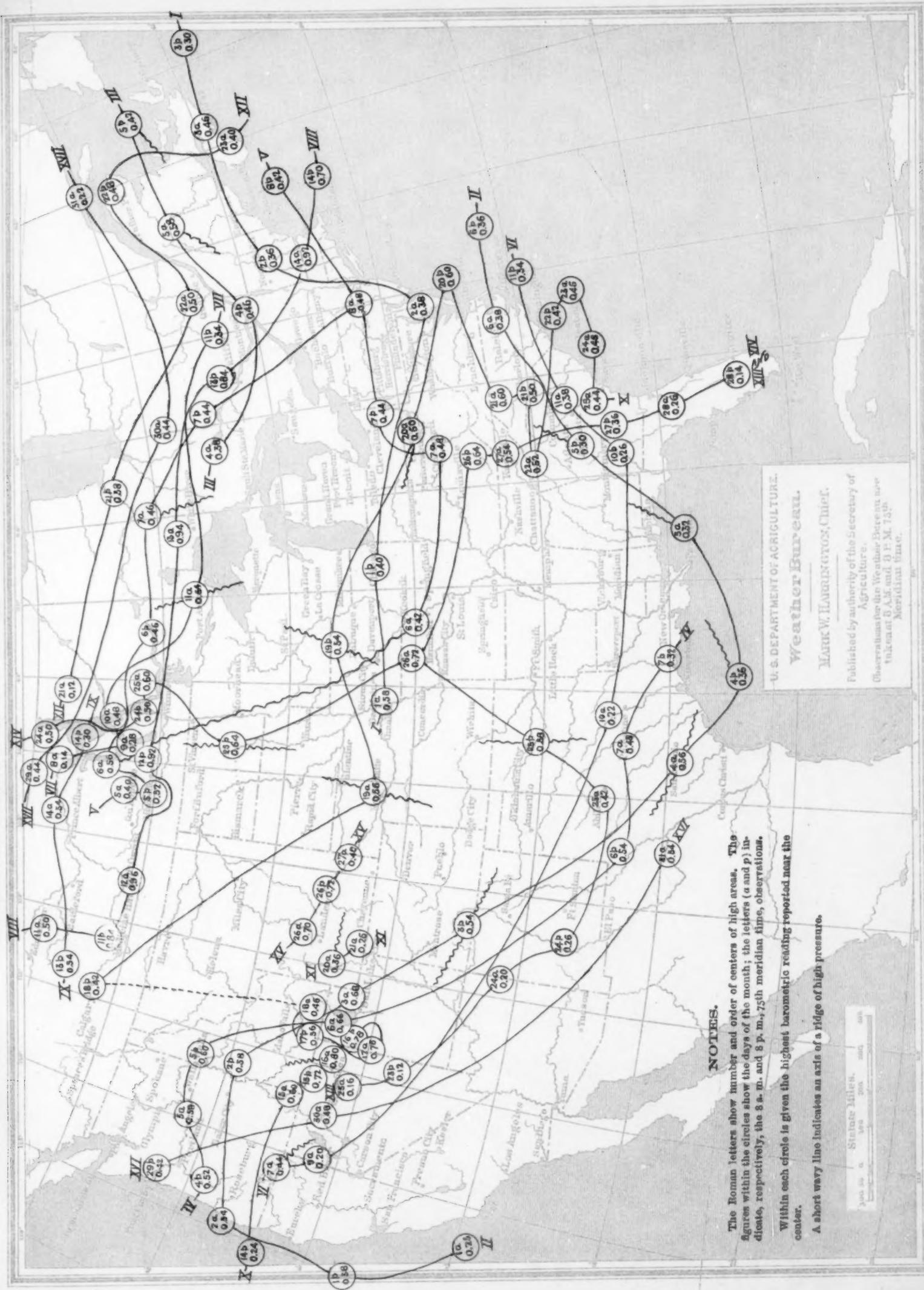


Chart V. Normal Pressure (20 years) and Normal Resultant Wind Direction (15 years) for December.

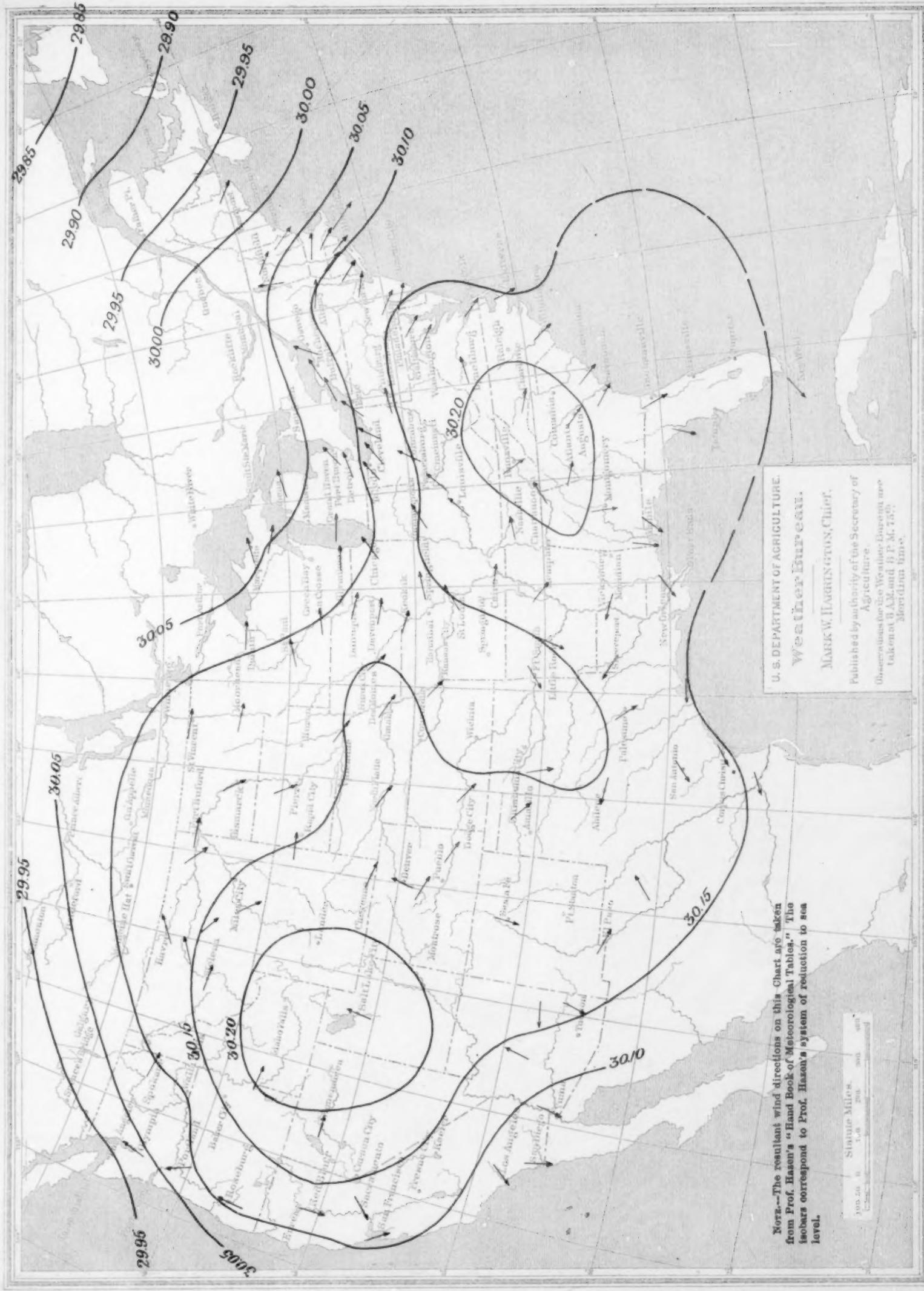


Chart VI. Depth of Snowfall (inches) and Limits of Freezing Weather, December, 1893.

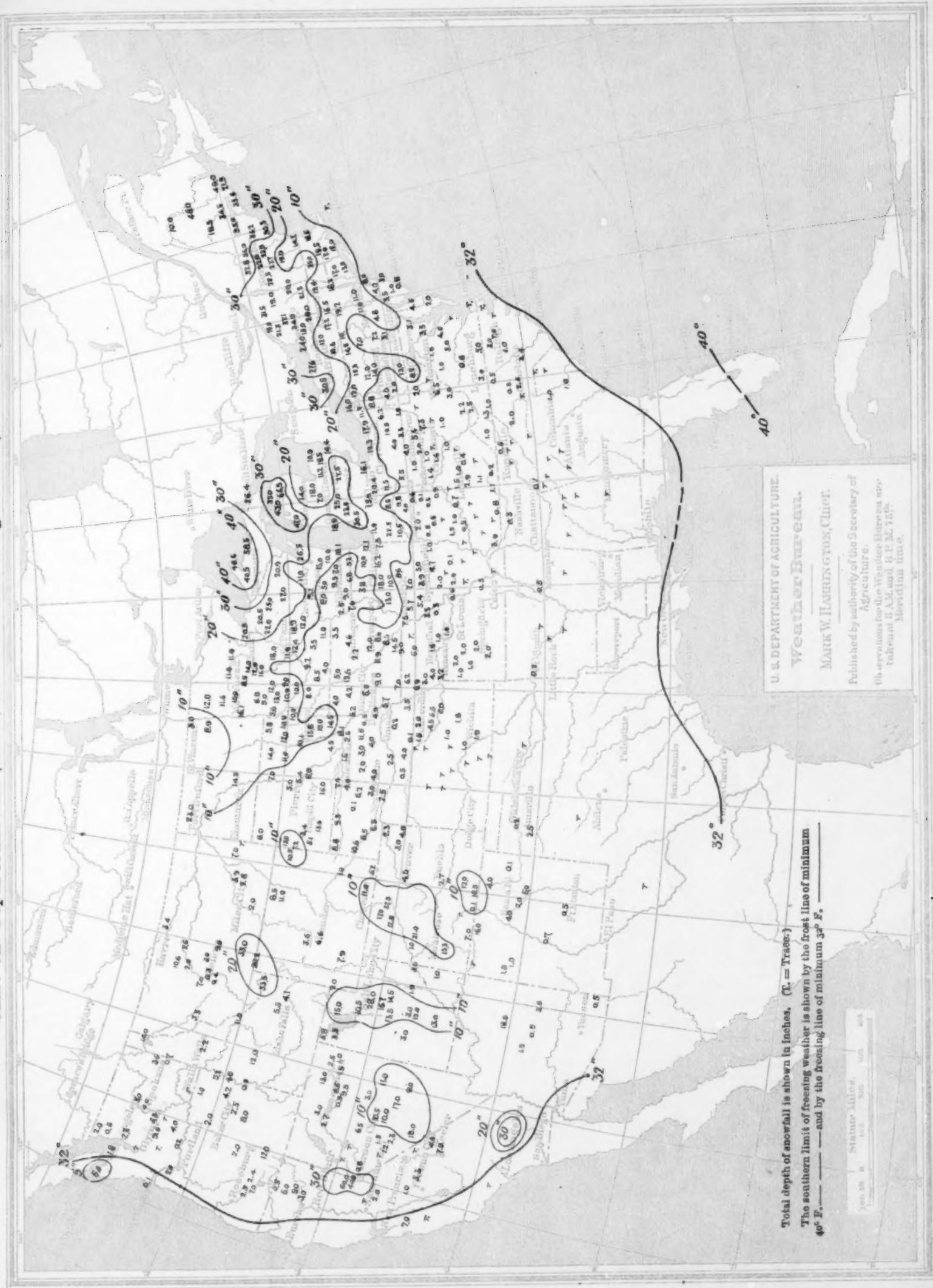


Chart VII. Depth of Snow lying on ground December 31, 1893.

